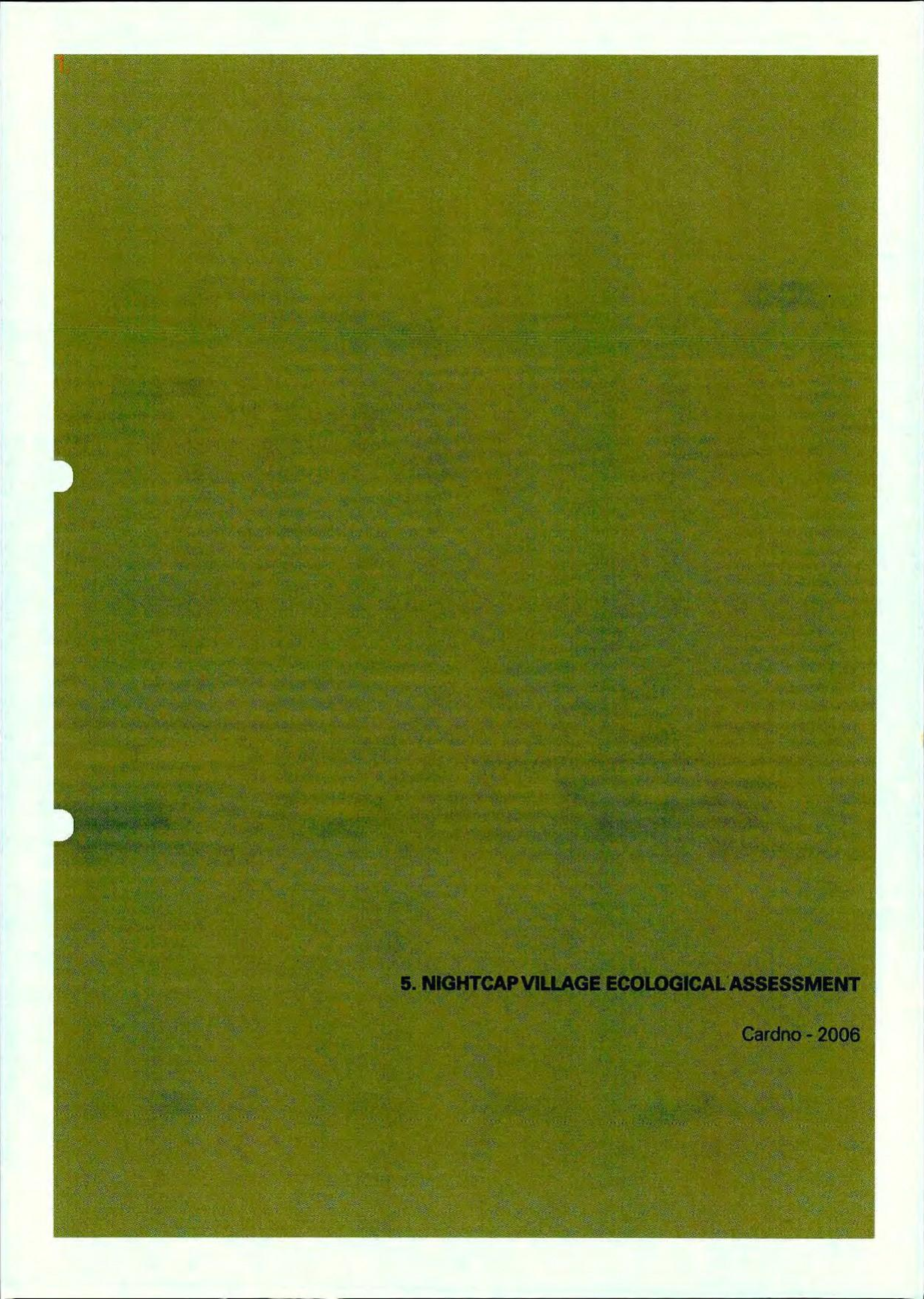
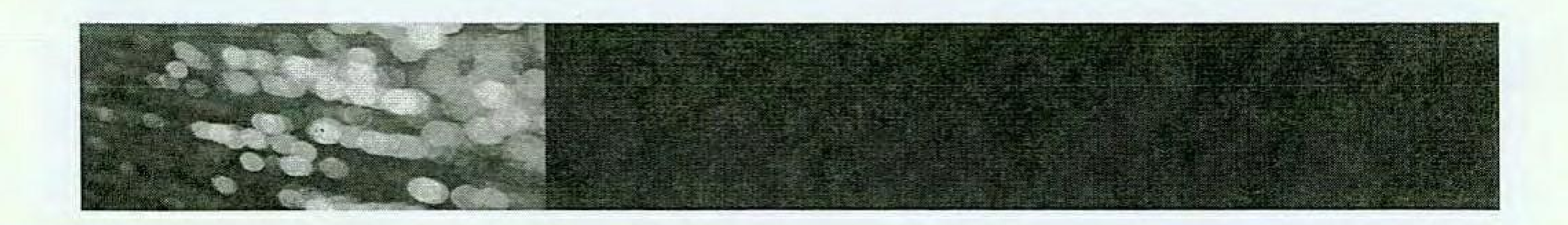


5. NIGHTCAP VILLAGE ECOLOGICAL ASSESSMENT

Cardno - 2006





Nightcap Urban Village

Ecological Assessment

7 August 2006
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Peter Van Lieshout



Cardno (Qld) Pty Ltd

ABN 57 051 074 992

5 Gardner Close Milton Q 4064

PO Box 388 Toowong

Queensland 4066 Australia

Telephone: 07 3369 9822

Facsimile: 07 3369 9722

International: +61 7 3369 9822

Email: cardno@cardno.com.au

Web: www.cardno.com.au

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Nightcap Urban Village

Ecological Assessment

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EXCECUTIVE SUMMARY

This Ecological Assessment has been prepared on behalf of Peter Van Lieshout with regards to Lot 3 on DP771335 and Lot 121 on DP134446 located on the Uki-Kyogle Road, Kunghur, Tweed Shire.

The objectives of this report are to provide an analysis of the nature conservation values of the site and the potential constraints to development of the site, or parts thereof, which may arise.

The report is based on the results of field surveys, examination of aerial photography, and a review of relevant literature resources including applicable Commonwealth, State and Local government legislation.

This assessment report provides:

1. In Section 2.0, information concerning the general characteristics of the site. In this respect it is noted that site is located on the Uki-Kyogle Road, 12 km south-west of Uki and is situated on the Tweed River in the valley between Mt Warning and the Nightcap Ranges. The site has a "2(d) Village" designation pursuant to the *Tweed Local Environment Plan 2000*.

2. In Section 3.0, information on the assessment methodology and field survey techniques. In this respect it is noted that a field survey was conducted on site on the 24th and 25th of January 2006. The aims of this survey were to collate site-specific information on the vegetation types and flora species that occur within the site and to detect and assess the presence of suitable habitat areas and resources for fauna species.

3. In Section 4.0, a description of the vegetation communities occurring within the site with reference to flora species of recognised conservation significance. In this respect it is noted that the site supports eight major vegetation communities and that, in general, vegetation within the site is represented by riparian vegetation lining the Tweed River, isolated clumps of trees and large areas of highly disturbed vegetation dominated by grasses and scattered trees. It is noted that a specimen of Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*), which is listed as *Endangered* pursuant to the *Threatened Species Conservation Act 1995*, was recorded within the site. It is also noted that two vegetation communities were recorded within the site which are considered to be broadly analogous to two Endangered Ecological Communities listed under the provisions of the *Threatened Species Conservation Act 1995*.

4. In Section 5.0, information concerning fauna species observed at the site and other species of conservation significance that may potentially utilise the site or adjacent land. It is noted that the disturbed nature of the majority of the site limits the availability of habitat resources for native fauna. However, the connective habitat associated with the Tweed River is considered, from an ecological standpoint, to be of importance as it provides native fauna with opportunities to disperse through and within the site and to move between broader areas of habitat which are situated upstream and downstream of the site. It is noted that evidence of Koala (*Phascolarctos cinereus*) habitat utilisation, a species listed as *Vulnerable* pursuant to the *Threatened Species Conservation Act 1995*, in the form of characteristic scratch marks and scats were observed within the site.



5. In Section 6.0, a description of the proposed plan of development, including details relevant to two management plans which would be implemented as part of the development to facilitate appropriate management of the site's key conservation values prior to and during the construction and occupational phases of the development.

6. In Section 7.0, an assessment of the degree of compliance the proposed plan of development achieves with the requirements of the local planning scheme and relevant Commonwealth and State government legislation with a biodiversity conservation focus. In this respect, it is noted that development of the site is subject to constraints imposed by various regulations that give recognition to and specific management requirements for species, communities and aspects of significant biodiversity conservation value. The degree of compliance that the proposed development achieves with the purpose, intent and specific performance criteria of various regulations with a biodiversity conservation focus is considered in this section.



1. INTRODUCTION

This Ecological Assessment has been prepared by Cardno on behalf of Peter Van Lieshout with regards to Lot 3 on DP771335 and Lot 121 on DP134446 located on the Uki-Kyogle Road, Kunghur, Tweed Shire ("the site"). The site locality is illustrated in Figure 1.

The objectives of this report are to provide an analysis of the nature conservation values of the site and the potential constraints to development of the site, or parts thereof, which may arise.

The report is based on field surveys, examination of aerial photography, and a review of relevant literature resources.

This assessment report provides:

1. In Section 2.0, information concerning the general characteristics of the site.
2. In Section 3.0, information on the assessment methodology and field survey techniques.
3. In Section 4.0, a description of the vegetation communities occurring within the site with reference to flora species of recognised conservation significance.
4. In Section 5.0, information concerning fauna species observed at the site and other species of conservation significance that may potentially utilise the site or adjacent land.
5. In Section 6.0, a description of the proposed plan of development.
6. In Section 7.0, an assessment of the degree of compliance the proposed plan of development achieves with the requirements of the local planning scheme and relevant Commonwealth and State government legislation with a biodiversity conservation focus.



2. SITE DESCRIPTION

The site is described as Lot 3 on DP771335 and Lot 121 on DP134446 and encompasses a total of 41 ha. The site is located on the Uki-Kyogle Road, 12 km south-west of Uki and is situated on the Tweed River in the valley between Mt Warning and the Nightcap Ranges. An aerial photograph of the site is presented in Figure 2.

The site is bound:

- to the south by Uki-Kyogle Road and to the south-west by a native plantation forest;
- to the north by partially cleared land and existing rural dwellings;
- to the east by partially cleared land and the Uki-Kyogle Road; and
- to the west by bushland.

Pursuant to the *Tweed Local Environment Plan 2000* ("*Tweed LEP*") the site has a "2(d) Village" designation which is classified as a "Residential" area under the *Tweed LEP*.

The vegetation across the majority of the site is dominated by pasture grassland with scattered clumps of trees. The majority of the site, including the clumps of trees, is highly disturbed, as a consequence of past vegetation clearance events and by the widespread invasion of exotic flora, principally Camphor laurel (*Cinnamomum camphora*). The site also supports riparian vegetation that fringes a section of the Tweed River which traverses the southern sectors of the site.



3. ASSESSMENT METHODOLOGY

3.1 Overview

To assess the biodiversity and conservation values of the site and the potential impacts of the proposed plan of development on these natural values, the following was conducted.

1. An initial review of background information on the flora and fauna of the site and adjacent properties from relevant sources, including a review of the report prepared 22 years ago by Gilmore and Milledge[1] which detailed the results of a wildlife survey conducted principally within land adjoining the site to the west (i.e. Mebbin Springs).

2. A field survey to collate information on the:

   - vegetation communities and flora species that occur on the site and on adjacent properties;

   - vertebrate fauna observed on the site, or those that are considered likely to utilise the site or adjacent properties due to the presence of suitable habitat; and

   - areas or aspects of the site identified as having functional wildlife conservation values or a high conservation status.

3. Evaluation of the potential impacts of the proposed plan of development on the ecological values of the site locality with particular attention given to those aspects which are of recognised conservation significance.

4. Evaluation of the degree of compliance the proposed plan of development achieves with the requirements of the local planning scheme and relevant State and Commonwealth legislation with a biodiversity conservation focus.

3.2 Field Survey Techniques

A field survey was conducted on site on the 24th and 25th of January 2006. An aim of the survey was to collate site-specific information on the vegetation types and flora species that occur within the site. The survey effort focused on detecting and assessing the presence of suitable habitat areas for flora species of formally recognised conservation significance that have been previously recorded, or are considered likely to occur, in the locality of the site.

The survey effort also focused on detecting and assessing the presence of suitable habitat areas and resources for fauna species, with particular emphasis on those species of formally recognised conservation significance that have been previously recorded, or considered likely to occur, in the locality of the site. In this respect, a search of the NSW National Parks and Wildlife Service online Atlas of NSW Wildlife database and the Commonwealth Department of Environment & Heritage's (DEH) online *Environment Protection and Biodiversity Conservation 1999* ("*EPBC Act*")

[1] Gilmore, A.M. & Milledge, D.R. (1984) *Wildlife Survey of Mebbin Springs*. A report prepared for Hoffah Pty Ltd by A.M. Gilmore and Associates.



database were used to assess records of species occurring, or likely to occur, within a 5 km radius of the site. The habitat requirements and the functional contribution that specific areas or aspects of the site may make towards the preservation of populations of these species in the site locality were then assessed.

3.3 Review of Gilmore and Milledge Report

A wildlife survey of land described as Mebbin Springs, which adjoins the site to the west was completed by A.M. Gilmore and Associates in March 1984, with the results detailed in a report prepared for Hoffah Pty Ltd by Gilmore and Milledge[2] in the same month of that year. The report provides information in relation to fauna species recorded within the Mebbin Springs site and broadly identifies the type and distribution of vegetation communities, and their constituent species, which occur across the study area.

It is recognised that the report prepared by Gilmore and Milledge contributes to available background information concerning the ecological values of the site locality. However, the following points are noted in respect of the currency and relevance of this information to the site in 2006.

1. The report was prepared over 22 years ago. Due consideration must be given to the fact that various anthropogenic and natural disturbances have occurred since the time of the report's publication which are likely to have impacted upon the values described therein. Examples of such disturbances include:

    a. forestry operations undertaken within land west of the site since 1984;

    b. increased land clearance and settlement within the locality;

    c. the passage of fire;

    d. predation by introduced predators; and

    e. disease.

2. The site itself does not appear to have been included within the area in which the wildlife survey was completed. In this regard, it is relevant to note that none of the wildlife species described within the 1984 report were actually observed, captured or recorded within the site.

[2] Gilmore, A.M. & Milledge, D.R. (1984) *Wildlife Survey of Mebbin Springs*. A report prepared for Hoffah Pty Ltd by A.M. Gilmore and Associates.



3. Unlike adjoining land to the west, which is characterised by relatively intact native wet sclerophyll and rainforest associations, the site:

    a. has been subject to widespread vegetation clearance events;

    b. predominantly supports cleared pasture lands with scattered clumps of trees; and

    c. has been successfully invaded by a range of exotic flora, with the most prevalent of these, Camphor laurel, being a principal component of many of the vegetation communities which occur on the site.

4. In contrast to the study area surveyed and described in the 1984 report, the site is relatively small and does not support either the extent or diversity of habitat types which would be required to support the wildlife species described by Gilmore and Milledge (1984)[3].

[3] Gilmore, A.M. & Milledge, D.R. (1984) *Wildlife Survey of Mebbin Springs*. A report prepared for Hoffah Pty Ltd by A.M. Gilmore and Associates.



4. FLORA HABITAT VALUES

4.1 Overview

Vegetation within the site is represented by riparian vegetation lining the Tweed River, isolated clumps of trees and large areas of highly disturbed vegetation dominated by grasses and scattered trees. Field surveys, completed in January 2006, identified a total of 97 plant species distributed across the site. A complete list of the plant species identified during the field surveys is provided in Appendix A. Major vegetation communities and their location within the site are illustrated in Figure 3. These include:

- a Brush box (*Lophostemon confertus*) open forest;
- a Flooded gum (*Eucalyptus grandis*) open forest;
- a Flooded Gum ± Brush Box ± Pink Bloodwood (*Corymbia intermedia*) open forest complex;
- a Hoop pine (*Araucaria cunninghamii*) open forest;
- a Rainforest and Myrtaceae complex;
- a Mixed species open forest;
- Riparian vegetation; and
- Cleared land.

4.2 Vegetation Types

4.2.1 Brush box (*Lophostemon confertus*) open forest

This community is situated in the central northern sections of the site. Its distribution within the site is illustrated in Figure 3. This community is characterised by Brush box (*Lophostemon confertus*) with scattered Pink bloodwood (*Corymbia intermedia*), Grey Ironbark (*Eucalyptus siderophloia*), Hoop Pine (*Araucaria cunninghamii*), Silky oak (*Grevillea robusta*) and Tallowwood (*E. microcorys*).

This community is considered to be analogous to Vegetation Type 207: Brush Box Open Forest pursuant to the Tweed Vegetation Management Strategy 2004[4]. Vegetation Type 207 is described as follows.

> *...a wet sclerophyll open forest over a range of terrains from wetter sheltered gullies to sites with fertile soils extending to the ridgetops. Frequently this type colonises lower slopes that have been cleared or rainforest areas that have been disturbed by fire. This type is considered to be an intermediate stage that will eventually revert to a rainforest*

[4] Kingston, M.B., Turnbull, J.W. and P.W. Hall (2004) *Tweed Vegetation Management Strategy 2004 Volume 3 of 3 – Appendices*. A report prepared for Tweed Shire Council by Ecograph: Ecological and Geographical Information Systems Consultants – Limpinwood, NSW



community and frequently possesses a well-developed rainforest understorey. Emergent Brush Box (Lophostemon confertus) *can be observed within older rainforest stands of the Shire. Brush Box* (L. confertus) *is often the major dominant but also occurs as a co-dominant with a range of Eucalypt species including, Tallowwood* (E. microcorys) *which may represent up to 50% of the type in some situations, Flooded Gum* (E. grandis) *and Camphor Laurel* (Cinnamomum camphora).

The mid layer of this community includes native species such as Red ash (*Alphitonia excelsa*), Cockspur thorn (*Maclura cochinchinensis*), Sandpaper fig (*Ficus fraseri*), *Gossia hillii*, Macaranga (*Macaranga tanarius*), Soft corkwood (*Caldcluvia paniculosa*), Native guava (*Rhodomyrtus psidioides*), Foambark (*Jagera pseudorhus*), Lightwood (*Acacia implexa*), Laceflower tree (*Archidendron grandiflorum*), Tree heath (*Trochocarpa laurina*), *Blechnum* sp., Guioa (*Guioa semiglauca*), Green wattle (*Acacia irrorata*), Jackwood (*Cryptocarya glaucescens*), Hard quandong (*Elaeocarpus obovatus*), White bottlebrush (*Callistemon salignus*), Scrub turpentine (*Rhodamnia rubescens*), *Persoonia conjuncta*, Red kennedy pea (*Kennedia rubicundra*), Bennett's ash (*Flindersia bennettiana*), Rice flower (*Ozothamnus diosmifolius*), Steelwood (*Sarcopteryx stipata*), Silky myrtle (*Decaspermum humile*), Lilly pilly (*Acmena smithii*), Rusty helicia (*Helicia ferruginea*), Kangaroo vine (*Cissus antarctica*) and Red kamala (*Mallotus philippensis*). Weed species that occurred within this layer include Lantana (*Lantana camara*), Easter cassia (*Senna pendula* var. *glabrata*), Wild tobacco (*Solanum mauritianum*), Camphor laurel seedlings (*Cinnamomum camphora*), Broad leaved privet (*Ligustrum lucidum*) and Persimmon (*Diospyros kaki*).

The ground layer is characterised by species such as *Lomandra longifolia*, Blady grass (*Imperata cylindrica*), Mistflower (*Ageratina riparia*), Bracken (*Pteridium esculentum*), *Blechnum* sp., Cobblers peg (*Bidens pilosa*), Snake vine (*Stephania japonica*), Barbed wire grass (*Cymbopogon refractus*), White passion flower (*Passiflora subpeltata*), Sawsedge (*Gahnia aspera*), *Paspalum* sp. and Austral sarsparilla (*Smilax australis*).

It is considered that this community is not analogous to any of the Endangered Ecological Communities listed under the provisions of the *Threatened Species Conservation Act 1995* ("*TSC Act*").

4.2.2 Flooded gum (*Eucalyptus grandis*) open forest

This community occurs in the north-western sector of the site with a waterway traversing the lower sections of this community. Its distribution within the site is illustrated in Figure 3. The canopy in the north-eastern sector of this community is characterised by Flooded gum (*Eucalyptus grandis*) with the western and lower sections dominated by Brush box and Camphor laurel. Other canopy species include Silky oak and Tallowwood.

This community is considered to be analogous to Vegetation Type 206: Flooded Gum Open Forest pursuant to the Tweed Vegetation Management Strategy 2004[5]. Vegetation Type 206 is described as follows.

...a tall open to open, wet sclerophyll forest on moderate to fertile soils, often in sheltered moist locations such as valley floors along watercourses. Flooded Gum (Eucalyptus grandis) *is generally the clear dominant species but this species often occurs with one or two associates. Typically associated canopy species, which occur*

[5] Kingston, M.B., Turnbull, J.W. and P.W. Hall (2004) *Tweed Vegetation Management Strategy 2004 Volume 3 of 3 – Appendices*. A report prepared for Tweed Shire Council by Ecograph: Ecological and Geographical Information Systems Consultants – Limpinwood, NSW



as co-dominants include Brush Box (Lophostemon confertus) *and Tallowwood* (E. microcorys). *Flooded Gum open forest frequently occurs with a rainforest understorey, which may in time replace this type. This species is known to require a major disturbance event such as fire to regenerate, forming as small even-aged stands. Species that occur as locally or sub-dominant species include Sydney Blue Gum* (E. saligna), *Turpentine* (Syncarpia glomulifera), *White Mahogany* (E. acmenoides), *Pink Bloodwood* (Corymbia intermedia), *Hoop Pine* (Araucaria cunninghamii) *and Silky Oak* (Grevillea robusta).

The mid storey of this vegetation community includes species such as Black bean (*Castanospermum australe*), Red ash, Hard quandong, Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*), Native tamarind (*Diploglottis australis*), Maiden's wattle (*Acacia maidenii*), Rice flower, Steelwood, *Leucopogon* sp., Native guava, *Seringia arborescens*, Sweet pittosporum (*Pittosporum undulatum*), Tree heath, Broad-leaf palm lily (*Cordyline petiolaris*), Rose myrtle (*Archirhodomyrtus beckleri*), Tuckeroo (*Cupaniopsis anacardiodes*), Guioa, Pointed-leaf hovea (*Hovea acutifolia*), Sandfly zieria (*Zieria smithii*) and Brown tuckeroo (*Cupaniopsis flagelliformis* var. *australis*).

The ground layer consists of species such as Bracken, Austral sarsparilla, Mistflower, Inkweed (*Phytolacca octandra*), Groundsel (*Baccharis halimifolia*), Blady grass, White passion flower and Snake vine.

It is considered that this community is not analogous to any of the Endangered Ecological Communities listed under the provisions of the *TSC Act*.

4.2.3 Flooded Gum ± Brush Box ± Pink Bloodwood open forest complex

This community occurs in the north-western corner of the site and is traversed by a small waterway that drains into the larger low-lying area in the central portions of the site. Its distribution within the site is illustrated in Figure 3. The canopy layer is characterised by Flooded gum, Brush box and Pink bloodwood with scattered Hoop pine and Grey ironbark.

This community is considered to be analogous to Vegetation Type 202: Grey Ironbark/ White Mahogany/Grey Gum Open Forest Complex pursuant to the Tweed Vegetation Management Strategy 2004[6]. Vegetation Type 202 is described as follows.

...a dry sclerophyll "mixed hardwood" open forest complex. It comprises a number of "sub-types" that were identified from field survey throughout the Tweed but for the purposes of mapping were combined due to their high level of intergradation and the difficulty involved in reliably detecting their boundaries from aerial photos. The open forest "sub-types" identified were –

- *White Mahogany - Tallowwood - Brush Box;*
- *Grey Gum with Grey Ironbark and/or Turpentine and/or Pink Bloodwood and/or Tallowwood and/or White Mahogany;*
- *Pink Bloodwood and/or Tallowwood and/or Flooded Gum and/or Brush Box; and*
- *Grey Ironbark and/or Pink Bloodwood and/or Tallowwood and/or Sydney Blue Gum and/or Red Mahogany.*

[6] Kingston, M.B., Turnbull, J.W. and P.W. Hall (2004) *Tweed Vegetation Management Strategy 2004 Volume 3 of 3 – Appendices*. A report prepared for Tweed Shire Council by Ecograph: Ecological and Geographical Information Systems Consultants – Limpinwood, NSW



> *The dominant or co-dominant species of this type include Grey Ironbark* (E. siderophloia), *White Mahogany* (E. acmenoides), *Grey Gum* (E. propinqua), *Pink Bloodwood* (Corymbia intermedia), *Tallowwood* (E. microcorys) *and Brush Box* (Lophostemon confertus). *Sub-dominant species of this type include Forest Red Gum* (E. tereticornis), *Sydney Blue Gum* (E. saligna), *Red Mahogany* (E. resinifera), *Flooded Gum* (E. grandis), *Turpentine* (Syncarpia glomulifera) *and Thick-leaved Mahogany* (E. carnea). *The mid-story layer varies from a closed association of rainforest species to a more open association of sclerophyll species; Forest Sheoak is a commonly occurring species throughout.*

The mid layer of this vegetation community consists of species such as *Seringia arborescens*, Plum myrtle (*Pilidiostigma glabra*), Long-leaved mock olive (*Notelaea longifolia* forma *glabra*), Blue lilly pilly (*Syzygium oleosum*), Coffee bush (*Breynia oblongifolia*), Red ash, Lantana, Rice flower, Wild tobacco and Camphor laurel seedlings.

The ground layer consists of species such as Soft bracken (*Calochlaena dubia*), *Blechnum* sp., Mistflower, Blady grass, Crofton weed (*Ageratina adenophora*), Snake vine and Bracken.

It is considered that this community is not analogous to any of the Endangered Ecological Communities listed under the provisions of the *TSC Act*.

4.2.4 Hoop pine (*Araucaria cunninghamii*) open forest

This community occurs in the central sector of the site to the north of the creekline that traverses the central sections. Its distribution within the site is illustrated in Figure 3.

The canopy layer is dominated by Hoop pine (*Araucaria cunninghamii*) with scattered species such as Silky oak and Camphor laurel.

The understorey is dominated by Lantana with scattered species such as Hard quandong, Rose myrtle, Muttonwood (*Rapanea variabilis*), Soft acronychia (*Acronychia pauciflora*), Tuckeroo, Pointed-leaf hovea, Camphor laurel seedlings, *Gahnia aspera*, *Lomandra longifolia*, Mistflower, Poison peach (*Trema tomentosa*), Easter cassia, Red kamala, Blackberry nightshade (*Solanum nigrum*) and Cockspur thorn.

It is considered that this community is not analogous to any of the Endangered Ecological Communities listed under the provisions of the *TSC Act*.

4.2.5 Rainforest and Myrtaceae complex

This community occurs in the north-eastern sector of the site and is traversed by a drainage line that discharges into the Tweed River. Its distribution within the site is illustrated in Figure 3. The canopy layer is characterised by Grey ironbark, Brush box and Camphor laurel with scattered Silky oak, Hoop pine and *Acacia* sp. The vegetation in the far north-eastern corner of this community is dominated by Small fruited grey gum (*Eucalyptus propinqua*). The southern section of this vegetation is considered to be analogous to Vegetation Type 102: Sub-tropical/Warm Temperate Rainforest pursuant to the Tweed Vegetation Management Strategy 2004[7]. This vegetation type is described as follows.

[7] Kingston, M.B., Turnbull, J.W. and P.W. Hall (2004) *Tweed Vegetation Management Strategy 2004 Volume 3 of 3 – Appendices*. A report prepared for Tweed Shire Council by Ecograph: Ecological and Geographical Information Systems Consultants – Limpinwood, NSW



Sub-tropical Rainforests are the most complex sub-formations within NSW, occurring in warm sites with a high annual rainfall. Typically comprising two or three vegetation strata and forming an uneven canopy with strangling figs, palms, plank buttresses, large epiphytes and woody vines (Floyd 1990). These forests occur at low altitudes on fertile lowland krasnozem soils near sea level or on basaltic soils up to 600m.

Main canopy species of this component include White Booyong (Argyrodendron trifoliolatum), *Red Carabeen* (Geissois benthamii), *Marara* (Pseudoweinmannia lachnocarpa), *Pepperberry Ash* (Cryptocarya obovata), *Cudgerie* (Flindersia schottiana), *Yellowwood* (F. xanthoxyla), *Red Cedar* (Toona ciliata), *Tulipwood* (Harpullia pendula), *Blue Quandong* (Elaeocarpus angustifolius), *Hard Quandong* (E. obovatus), *Myrtle Ebony* (Diospyros pentamera), *Black Bean* (Castanospermum australe), *Red Bean* (Dysoxylum muelleri), *Purple Cherry* (Syzygium crebrinerve), *Bangalow Palm* (Archontophoenix cunninghamiana), *Cabbage Palm* (Livistona australis), *Black Booyong* (Argyrodendron actinophyllum), *Giant Stinging Tree* (Dendrocnide excelsa), *Yellow Carabeen* (Sloanea woollsii), *Rosewood* (Dysoxylum fraserianum), *Giant Water Gum* (Szygium francisii), *Soft Corkwood* (Caldcluvia paniculosa), *Pigeonberry Ash* (Cryptocarya erythroxylon), *Prickly Ash* (Orites excelsa), *Doughwood* (Melicope octandra) *and Red Apple* (Acmena ingens).

Warm Temperate Rainforests contain fewer species than sub-tropical and dry rainforests and forms a more uniform canopy with typically two vegetation strata (Floyd 1990). They occur in cool, moist areas and tend to lack epiphytes, orchids and tropical features such as stranglers, plank buttresses, woody vines and palms (Floyd 1990). The occurrences of this suballiance within Tweed Shire are among the most floristically diverse in NSW due to their geographical location and mixed nature (Floyd 1990). They occur on less fertile metasediments, basaltically enriched metasediments and on rhyolite with basaltic enrichment on alluvial flats. Specific occurrences are Hogan's Scrub Wildlife Refuge (containing a State record for different tree species present (Floyd 1990)), lower Couchy Creek and Christies Creek in Mooball State Forest.

Main canopy species of this component include Jackwood (Cryptocarya glaucescens), *Sassafras* (Doryphora sassafras), *Mango Bark* (Canarium australasicum), *Yellow Carabeen* (Sloanea woollsii), *Durobby/Coolamon* (Syzygium moorei), *Coachwood* (Ceratopetalum apetalum), *Callicoma* (Callicoma serratifolia), *Water Gum* (Tristaniopsis laurina), *Bennet's Ash* (Flindersia bennettiana) *and some sub-tropical species.*

The mid layer in this vegetation community on the site includes species such as Broad leaved privet, Hard quandong, Easter cassia, Lightwood, Sweet pittosporum, Rice flower, Red ash, Sandpaper fig, Lantana, Poison peach, Native holly (*Alchornea ilicifolia*), Cockspur thorn and White bottlebrush.

The ground layer includes species such as *Gahnia aspera*, Mistflower, *Lomandra hystrix*, Climbing nightshade (*Solanum seaforthianum*), Climbing asparagus (*Asparagus plumosus*), Crofton weed, Cobblers peg, Groundsel bush and Blue billygoat weed (*Ageratum houstonianum*).

It is considered that this community is broadly analogous to two Endangered Ecological Communities listed under the provisions of the *TSC Act*, namely:

- *Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion*; and
- *Sub-tropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion.*



Descriptions of the above two listed Endangered Ecological Communities, which have been sourced and adapted from the NSW's Department of Environment and Conservation are presented in Appendix B.

4.2.6 Mixed species open forest

This community occurs in the central southern sector of the site. Its distribution within the site is illustrated in Figure 3. The canopy layer includes species such as Camphor laurel, Silky oak, Brush box, *Acacia* sp. and Flooded gum with scattered Bunya pine (*Araucaria bidwillii*), Pink bloodwood and Hoop pine.

The mid layer is characterised by Lantana thickets with scattered species such as Pepperberry ash (*Cryptocarya obovata*), Tree heath, Lilly pilly, Hairy supplejack (*Ripogonum elseyanum*), Guioa, Red ash, Sandpaper fig, Red kamala, Wild tobacco, Cockspur thorn, Coffee bush, Lightwood and Camphor laurel seedlings.

The ground layer includes species such as *Gahnia aspera*, Native holly, Rough maidenhair fern (*Adiantum hispidulum*), Bracken, Poison peach, Mistflower, White passion flower and Snake vine.

It is considered that this community is not analogous to any of the Endangered Ecological Communities listed under the provisions of the *TSC Act*.

4.2.7 Riparian vegetation

This community fringes the banks of the Tweed River that traverses the southern sections of the site. Its distribution within the site is illustrated in Figure 3. This community is considered to be analogous to Vegetation Type 102: Sub-tropical/Warm Temperate Rainforest pursuant to the Tweed Vegetation Management Strategy 2004, a description of which is provided in Section 4.2.5.

This vegetation community within the site is also characterised by species such as Weeping bottlebrush (*Callistemon viminalis*), Lilly pilly, White cedar (*Melia azedarach*), Camphor laurel, Sandpaper fig, Flooded gum, Cadaghi (*Corymbia torelliana*), Water gum (*Tristaniopsis laurina*), Bush lemon (*Citrus limon*), *Acacia* sp., Red Kamala, Rough maidenhair fern, Poison peach, *Lomandra hystrix*, Cockspur thorn, Lightwood, Coffee bush, Wild tobacco, Lantana, Mistflower, Madeira vine (*Anredera cordifolia*) and Bracken.

It is considered that this community is broadly analogous to two Endangered Ecological Communities listed under the provisions of the *TSC Act*, namely:

- *Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion*; and
- *Sub-tropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion*.

Descriptions of the above two listed Endangered Ecological Communities are presented in Appendix B.



4.2.8 Cleared land

The balance of the land has been previously cleared and supports pasture grasses and some scattered trees. The scattered trees include species such as Silky oak, Forest red gum (*Eucalyptus tereticornis*), Small fruited grey gum, Turpentine (*Syncarpia glomulifera*), Hoop pine, Tallowwood, *Macadamia tetraphylla*, Crows ash (*Flindersia australis*), Camphor laurel, Brush box, White bottlebrush, Fig (*Ficus* sp.) and White doughwood (*Melicope micrococca*).

It is considered that this community is not analogous to any of the Endangered Ecological Communities listed under the provisions of the *TSC Act*.

4.3 Flora Species of Significance

A review of flora records from the site locality was undertaken to assess the occurrence or likely occurrence of significant flora species pursuant to the *TSC Act*, the *EPBC Act* and the *Noxious Weeds Act 1993*. Records utilised included records held within the Atlas of NSW Wildlife and *EPBC Act* Online databases.

4.3.1 Threatened Species

A review of flora records from the site locality indicated 26 species of conservation significance that may potentially occur on the site based upon the availability of suitable habitat. These species and their relevant status under the *EPBC Act* and *TSC Act* are provided in Table 1.

Table 1 Significant flora species likely to occur in the site locality

Species Name	Common Name	Status *
Arthraxon hispidus	Hairy-joint grass	CV
Austromyrtus fragrantissima	Scale myrtle, Sweet myrtle	CE
Bosistoa selwynii	Heart-leaved Bosistoa	CV
Bosistoa transversa	Three-leaved Bosistoa	CV
Bulbophyllum globuliforme	Miniature moss-orchid	CV
Corokia whiteana	-	CV
Davidsonia jerseyana	Davidson's plum	NE
Desmodium acanthocladum	Thorny pea	CV
Diospyros mabacea	Red-fruited ebony, Silky persimmon, Ebony	CE
Diploglottis campbellii	Small-leaved tamarind	CE
Doryanthes palmeri	Spear lily	NV
Endiandra floydii	Floyd's walnut	CE
Endiandra hayesii	Rusty rose walnut, Velvet laurel	CV
Floydia praelta	Ball nut, Possum nut	CV
Fontainea australis	Southern fontainea	CV
Hicksbeachia pinnatifolia	Monkey nut, Bopple nut	CV
Macadamia tetraphylla	Macadamia nut, Rough-shelled bush nut	CV
Marsdenia longiloba	Clear milkvine	CV
Ochrosia moorei	Southern ochrosia	CE, NV
Owenia cepiodora	Onionwood, Onion cedar	CV
Ozothamnus vagans	-	CV
Sarcochilus hartmannii	Waxy sarcochilus	CV
Sophora fraseri	-	CV
Symplocos baeuerlenii	Small-leaved hazelwood, Shrubby hazelwood	CV
Syzygium hodgkinsoniae	Smooth-bark rose apple, Red lilly pilly	CV
Tinospora tinosporoides	Arrow-head vine	CV

* CE, CV = Commonwealth (Endangered, Vulnerable) – *EPBC Act*
NE, NV = New South Wales (Endangered, Vulnerable) – *TSC Act*



Field surveys recorded two specimens of *Macadamia tetraphylla*, which is listed as *Vulnerable* pursuant to the *EPBC Act*, within the site. These trees occur on a knoll in the centre of the site amongst previously cleared land. Both specimens appear to be cultivated and, judging by their occurrence adjacent to other planted out trees (e.g. Grevilleas), are landscape plantings.

Field surveys also recorded a specimen of Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*), which is listed as *Endangered* pursuant to the *TSC Act*, as occurring within the Flooded gum open forest community in the site (refer Figure 3). A sample of this specimen was lodged on the 8th February 2006 with the Queensland Herbarium for confirmation of identification. The sample was subsequently identified and confirmed by the Queensland Herbarium, on the 14th February 2006 to be *E. muelleri* subsp. *bracteata*.

Gilmore and Milledge (1984)[8] recorded specimens of *E. muelleri* associated with a closed forest (subtropical rainforest) on land adjoining the site to the west. In this respect it is noted that, since the publication of the Gilmore and Milledge report, taxonomic revisions have deemed *E. muelleri* to consist of two sub-species (namely *bracteata* and *muelleri*) which are both distributed across similar habitat. Whilst it is not possible to determine which of these sub-species were recorded by Gilmore and Milledge (1984)[8], it would be reasonable to expect, given the close proximity of their study area, that *E. muelleri* subsp. *bracteata* was encountered during their survey. It is relevant to note that *E. muelleri* subsp. *muelleri* is not listed under the provisions of the *TSC Act*.

4.3.2 Weed Species

The *Noxious Weed Act 1993* aims to reduce the negative impacts of weeds by preventing the establishment of significant new weeds whilst the restricting the spread and reducing the distribution of existing significant weeds. It also provides for monitoring and reporting on the outcome of weed management within the State. Pursuant to the *Noxious Weed Act 1993*, a weed may be classified as one of the following categories.

> ***Class 1, State Prohibited Weeds:*** *Class 1 noxious weeds are plants that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent.*
>
> ***Class 2, Regionally Prohibited Weeds:*** *Class 2 noxious weeds are plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent.*
>
> ***Class 3, Regionally Controlled Weeds:*** *Class 3 noxious weeds are plants that pose a serious threat to primary production or the environment of an area to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area.*
>
> ***Class 4, Locally Controlled Weeds:*** *Class 4 noxious weeds are plants that pose a threat to primary production, the environment or human health, are widely*

[8] Gilmore, A.M. & Milledge, D.R. (1984) *Wildlife Survey of Mebbin Springs*. A report prepared for Hoffah Pty Ltd by A.M. Gilmore and Associates



distributed in an area to which the order applies and are likely to spread in the area or to another area.

Class 5, Restricted Plants: *Class 5 noxious weeds are plants that are likely, by their sale or the sale of their seeds or movement within the State or an area of the State, to spread in the State or outside the State.*

A noxious weed that is classified as a Class 1, 2 or 5 noxious weed is referred to in the Noxious Weed Act as a notifiable weed. The significant weed species pursuant to the *Noxious Weeds Act 1993* for the Far North Coast County Council that were recorded on the site are detailed in Table 2.

Table 2 Declared weed species that were recorded on the site

Species Name	Common Name	Control Category *
Baccharis halimifolia	Groundsel bush	W2
Ageratina adenophora	Crofton weed	W3
Lantana camara	Lantana	W3
Ageratina riparia	Mistflower	W3
Cinnamomum camphora	Camphor laurel	W4 (d)

* Within the Far North Coast Weeds district the following Control Categories apply.

W1 = The presence of these weeds on land (or on/in water) must be reported to the Local Control Authority, and the weed must be fully and continuously suppressed and destroyed

W2 = The weed must be fully and continuously suppressed and destroyed

W3 = The weed must be prevented from spreading and its numbers and distribution reduced

W4 = The action specified in the declaration must be taken in respect of these weeds

W4(b) = The weed must not be sold, propagated or knowing distributed and any existing weed must be prevented from flowering and fruiting

W4(d) = The weed must not be sold, propagated or knowingly distributed and the weed must be fully and continuously suppressed and destroyed if it is:

- *three (3) metres in height or less; or*
- *within half a kilometre of remnant urban bushland, as defined by SEPP 19, and is not deemed by a local control authority as having historical or heritage significance; or*
- *is over three metres in height and not included in a Management Plan approved by the local control authority.*
- *The W4(d) declaration applies to Copmanhurst, Kyogle, Richmond Valley and Lismore Council areas and that part of Ballina Council area south of the Bruxner Highway*

W4(f) = Shall not be sold, propagated or knowingly distributed. Occupiers must implement any biological control or other program directed by the local control authority must be implemented.

W4(g) = The weed must not be sold, propagated or knowingly distributed.



5. FAUNA HABITAT VALUES

5.1 Fauna Habitat Assessment

A fauna habitat assessment of the site was carried out using the methodology described in Section 3.0 herein. Due to its general lack of contiguous vegetative cover, the majority of the site provides a limited variety of fauna habitat resources that are suitable for utilisation by native species. It is recognised that the site's most important ecological feature is the section of the Tweed River which traverses its southern extent. This section of the Tweed River is fringed by riparian vegetation which provides a relatively narrow dispersal corridor from intact bushland west of the site through to predominantly cleared land to the site's east. A brief summary of the site's existing fauna habitat types is provided as follows.

5.2 Birds

The site's riparian vegetation and clumped patches of open forest are likely to provide temporary and permanent nesting, perching and foraging habitat for a range of avian species, including the following species identified within the site: Pied currowong (*Strepera graculina*), Australian magpie (*Gymnorhina tibicen*), Spangled drongo (*Dicrurus bracteatus*), Laughing kookaburra (*Dacelo novaeguineae*), Pied butcherbird (*Cracticus nigrogularis*), Sulphur crested cockatoo (*Cacatua galerita*), Yellow-tailed black cockatoo (*Calyptorhynchus funereus*), Pheasant coucal (*Centropus phasianinus*), Torresian crow (*Corvus orru*), Mistletoebird (*Dicaeum hirundinaceum*), Black faced monarch (*Monarcha melanopsis*), Eastern whipbird (*Psophodes olivaceus*), Welcome swallow (*Hirundo neoxena*), Noisy friarbird (*Philemon corniculatus*), Eastern yellow robin (*Eopsaltria australis*), Tawny frogmouth (*Podargus strigoides*), Rainbow lorikeet (*Trichoglossus haematodus*) and Rainbow bee-eater (*Merops ornatus*).

It is recognised that the forest clumps and riparian vegetation along the Tweed River provide potential habitat resources for the Red-tailed black cockatoo (*Calyptorhynchus banksii*). However, it is considered that the site does not represent a significant or critical habitat resource for this species given:

- its relatively small size;
- its largely cleared extent;
- the occurrence of large expanses of intact bushland west of the site; and
- the site's close proximity to large protected reserves such as Mount Warning National Park, Border Ranges National Park and Mount Jerusalem National Park.

It is, however, noted that the part of the site that provides some functional ecological significance to the Red-tailed black cockatoo is the riparian vegetation community which occurs along the Tweed River, and which provides a movement corridor linking larger areas of habitat located upstream and downstream of the site.

It is considered that the site does not provide significant or critical habitat resources for the Glossy black cockatoo (*Calyptorhynchus lathami*). Whilst it is recognised that Glossy black-cockatoos do occasionally eat seeds from eucalypts, angophoras, acacias and hakeas, as well as eating insect larvae, their primary food resource is



widely recognised to be the seeds of mature *Allocasuarina* trees[9] and the species' presence is often indicated by a layer of cracked cones and fragments that have accumulated under favoured *Allocasuarina* trees. As such, Glossy black cockatoos characteristically inhabit forests on sites with low soil nutrient status which reflect the distribution of key *Allocasuarina* spp.[10] In this respect, it is relevant to note that *Allocasuarina* species are not prevalent across the site and were not identified as being characteristic of the mid or over storey layer in any of the site's vegetation assemblages. It is also relevant to note that this species was not observed nor were any signs of habitat utilisation by this species recorded within the adjacent Mebbin Springs site by Gilmore and Milledge[11].

The site's open nature would increase the likelihood of it being utilised by a range of avian predators during their broader searches within the locality for prey, including the Whistling kite (*Haliastur sphenurus*) and Wedge tailed eagle (*Aquila audax*). It is also relevant to note that, given the large extent of wet sclerophyll forest within the vicinity of the site (i.e. that associated with land to the west and, more significantly with Mount Warning National Park, Border Ranges National Park and Mount Jerusalem National Park), it is likely that the site is situated within the home range of the Powerful Owl (*Ninox strenua*) and the Sooty owl (*Tyto tenebricosa*). In this regard, it is noted that the size of the site is relatively small in comparison to the large extents of protected reserve and wooded rural lands in its vicinity and that the contribution that it would make to the home range of either owl species is unlikely to be significant.

Similarly it is recognised that the vegetation communities associated with the Tweed River provide potential habitat resources for the White eared monarch (*Monarcha leucotis*). However, it is noted that the size of the site is relatively small in comparison to the large extents of protected reserve which encompass largely areas of such habitat and that, as such, the contribution that the site would make to available habitat for this species within the site locality is unlikely to be significant. The part of the site that is of some functional ecological significance to the White eared monarch is the riparian vegetation community associated with the Tweed River, which provides a movement corridor linking larger areas of habitat located upstream and downstream of the site.

The open and exposed nature of the majority of the site is likely to exclude the more cryptic and/or secretive avian species from utilising the available habitat, with these species more likely to be associated with the typically denser mid-strata vegetation associated with the riparian vegetation that traverses the Tweed River.

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[9] NSW National Parks and Wildlife Service web site - http://www.nationalparks.nsw.gov.au/npws.nsf/Content/glossy_black_cockatoos. Accessed 7th August 2006.

[10] NSW National Parks and Wildlife Service web site. Threatened Species Information: Glossy black cockatoo. http://www.nationalparks.nsw.gov.au/PDFs/tsprofile_glossy_black_cockatoo.pdf. Accessed 7th August 2006

[11] Gilmore, A.M. & Milledge, D.R. (1984) *Wildlife Survey of Mebbin Springs*. A report prepared for Hoffah Pty Ltd by A.M. Gilmore and Associates



5.3 Arboreal Mammals

Arboreal mammals visually sighted within the site include the Common brushtail possum (*Trichosurus vulpecular*) and the Common ringtail possum (*Pseudocheirus peregrinus*). Species such as these would be likely to utilise hollow bearing trees across the site, especially, within the more intact and sheltered riparian vegetation associated with the Tweed River and open forest communities. It is relevant to note that both of these species have been previously recorded as occurring within the site locality[12]. It is also acknowledged that Mountain brushtail possums (*T. caninus*), which were previously recorded in the site locality by Gilmore and Milledge (1984)[13], are likely to occur and utilise available habitat within the site.

Characteristic Koala (*Phascolarctos cinereus*) scratch marks, of an indeterminable age, were recorded on several *Eucalyptus propinqua* within the north-eastern extent of the site and characteristic Koala scats were collected from the base of an *E. microcorys* to the north of the site's central knoll. Whilst, it is recognised that Koalas utilise habitat within the site, it is considered, given its sparse vegetative cover, high densities of Camphor laurel and relatively small size, in comparison to larger tracts of bushland in the locality, that the site represents a transitory habitat resource for this species rather than permanent habitat for a resident population.

Although it is recognised that Koalas are capable of moving over large expanses of open ground, the riparian vegetation which fringes the section of the Tweed River is considered to represent an important off-site linkage to broader areas of habitat which Koalas and other arboreal fauna are likely to utilise during broader movements within the locality.

5.4 Terrestrial Mammals

The expanses of grassland within the site provide potential foraging resources for larger terrestrial mammals such as the Eastern grey kangaroo (*Macropus giganteus*), Whiptail wallaby (*Macropus parryi*) and the Red-necked wallaby (*Macropus rufogriseus*) known to occur within the site locality[14]. The scattered patches of open forest and riparian habitats may be utilised by smaller terrestrial mammals such as the Common planigale (*Planigale maculata*), Northern brown bandicoot (*Isoodon macrourus*) and the Bush rat (*Rattus fuscipes*). The Tweed River that traverses the southern sections of the site provides potential habitat resources for the Platypus (*Ornithorhynchus anatinus*).

5.5 Flying Mammals

The riparian vegetation associated with the Tweed River and forest clumps within the site are likely to provide suitable habitat for a variety of common microchiropteran bats, such as the Gould's wattled bat (*Chalinolobus gouldii*), Chocolate wattled bat (*Chalinolobus morio*), and Gould's long-eared bat (*Nyctophilus gouldi*). These species

[12] Records derived from the NSW National Parks and Wildlife Service's Wildlife Atlas on the 3rd of February 2006 – http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlasSpecies.jsp

[13] Gilmore, A.M. & Milledge, D.R. (1984) *Wildlife Survey of Mebbin Springs*. A report prepared for Hoffah Pty Ltd by A.M. Gilmore and Associates

[14] Records derived from the NSW National Parks and Wildlife Service's Wildlife Atlas on the 3rd of February 2006 – http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlasSpecies.jsp



are likely to forage for insects above and below the canopy of these vegetation communities.

A limited range of megachiropteran species, including the Black flying-fox (*Pteropus alecto*) and Grey headed flying fox (*P. poliocephalus*), may occasionally forage within the site during the flowering period of its dominant tree species. However, given the limited number and scattered distribution of these trees within the site and the large extent of more suitable bushland habitat within the surrounding locality, it is considered unlikely that the site provides megachiropteran species with significant foraging habitat.

5.6 Reptiles

The vegetation communities across the site provide potential habitat resources for a range of reptile species such as the Brown tree snake (*Boiga irregularis*), Eastern bearded dragon (*Pogona barbata*), Red-bellied black snake (*Pseudechis porphyriacus*) and the Bar-sided forest-skink (*Eulamprus tenuis*). It is expected that the waterways that traverse the site would be utilised by species such as the Eastern water dragon (*Physignathus lesueurii*) and a limited range of common turtle species, including the Eastern snake-necked turtle (*Chelonia longicollis*) and the Saw shelled turtle (*Elseya latisternum*). During field surveys, a turtle was observed within a waterhole associated with the drainage line in the north-eastern section of the site which supports the Rainforest and Myrtaceae complex.

5.7 Amphibians

The vegetated sections of the smaller waterways that flow through the northern and central sections of the site and the riparian vegetation associated with the Tweed River provide suitable habitat resources for a range of common amphibian species such as the Green tree frog (*Litoria caerulea*), Striped marsh frog (*Limnodynastes peronii*) and the Red-backed toadlet (*Pseudophryne coriacea*). The Cane toad (*Bufo marinus*) was recorded calling across the site during field surveys.

It is acknowledged that the riparian vegetation associated with the Tweed River in the sites' southern extent provides potential habitat for the Giant barred frog (*Mixophyes iteratus*), in that it contains shallow rocky sections bordered by wet sclerophyllous and rainforest flora species. The relatively small extent of the Tweed River that flows through the site, and the generally disturbed nature of the site itself would indicate that this habitat is unlikely to represent significant, critical or even locally important habitat for this species. Furthermore, it is noted that larger expanses of more suitable habitat are located within the expanses of bushland west of the site and within creek and river systems associated with the adjacent Border Ranges and Mount Jerusalem National Parks. Nevertheless, it is also recognised that, due to the important ecological and connective values of vegetation associated with the Tweed River, there would be a requirement for any plan of development proposed for the site to appropriately conserve and protect habitat associated with this waterway.



5.8 Corridor Values

Although its width has been impacted upon by previous land clearance events and the composition of its species assemblage has been influenced by the invasion of exotic flora, it is considered that the riparian vegetation associated with the Tweed River represents the feature of greatest ecological importance within the site in terms of providing movement opportunities for native fauna. Whilst it is recognised that the forest clumps in the northern and central parts of the site are likely to provide transitory habitat resources for smaller dispersing fauna, these clumps are largely fragmented from any adjoining expanses of bushland. As such, native fauna moving between these clumps would be required to cross through large areas of open land where they would be duly exposed to the risk of predation by native (e.g. birds of prey) and introduced (e.g. Dogs, Cats and Foxes) predators. In this respect, it is considered that these forest clumps are likely to be limited to functioning as "stepping-stone" habitat for highly mobile species (e.g. birds and bats). The cleared areas of the site have a limited value in terms of contributing to broader wildlife movements within the locality, with the exception of the movements of large terrestrial species (e.g. kangaroos, wallabies).

With respect to the site's corridor values it is relevant to note the following.

1. The entire site has a "Village" designation pursuant to the *Tweed LEP*. This designation is considered to constitute a "residential" area under the provisions of this plan. Whilst it is acknowledged that complete development of the site is likely to be constrained by the provisions of relevant State and Local government legislation, Council's intent is for the site to be developed for principally urban purposes. The orderly development of the site as a "Village" area, would limit utilisation of the site by native fauna as a movement corridor.

2. The site does not provide a connection between any protected reserves (i.e. National Park, State Forest etc.) nor does it provide a connection between any two large expanses of bushland. In this respect it is noted that land to the east and north of the site support cleared and partially cleared areas that are currently utilised for cattle grazing and other rural purposes.

3. The site is bordered to the south by the Uki-Kyogle Road which presents a barrier for fauna dispersal and a potentially high source of mortality for native fauna. With the exception of highly mobile fauna (i.e. birds and bats), native fauna species would be unlikely to successfully or safely disperse across this transport corridor during broader movements within the locality, thereby restricting fauna movement in a north-south direction.

4. The riparian vegetation associated with the Tweed River provides a linkage between intact and largely undisturbed vegetation west of the site and partially to completely cleared land to the east and north of the site. This riparian corridor is relatively narrow, due to the extent of past land clearance events. Nevertheless, it provides sheltered habitat along the majority of its extent within the site and is likely to be utilised by a range of wildlife species during broader movements within the locality.

5. Native fauna species that presently utilise the riparian vegetation along the Tweed River for movement within and across the site to include small reptiles, amphibians, birds and a limited diversity of mammals, including arboreal species such as Koalas. It is considered that whilst an increase to the current width of the riparian corridor would provide additional sheltering resources, given the



site's intended future land use, any such increase would be unlikely to initiate or promote utilisation of this riparian vegetation by fauna species which do not already frequent or occur within the site.

5.9 Significant Fauna Species

Field surveys, the Atlas of NSW Wildlife and the DEH Online databases have been utilised to compile a list of significant fauna species that may occur on the site or on adjacent properties. Previous distribution records and habitat requirements for these species have been examined to identify the likelihood of occurrence within the site. Each species has been allocated a rating of Very High, High, Moderate or Low according to the following criteria:

Very High: species observed on the site.

High: no site observations but previously recorded in the site locality by Gilmore and Milledge (1984)[15] or records for the species held by both the Atlas of NSW and DEH databases in the site locality, with *substantial* areas of suitable habitat on the site.

Moderate: no site observations, but previously recorded in the site locality by Gilmore and Milledge (1984) or Atlas of NSW records for the species in the site locality, with suitable habitat at the site.

Low: no site observations, but either Atlas of NSW records or DEH records for the species in the site locality, with *little or no* suitable habitat at the site.

A summary of the significant species which have a Very High, High and Moderate likelihood of occurrence, based on the availability of suitable habitat, are listed in Table 3.

In respect of the above categories it is noted that the Atlas of NSW Wildlife database is based on actual recorded sightings of a species whilst the DEH *EPBC Act* Protected Matters Report also includes species for which there are no actual sighting records. In this respect the Atlas of NSW Wildlife database records provide a more reliable indication that the species occurs in the survey area.

Table 3 Significant fauna species likely to occur on the site

Common Name	Species Name	Status*	Habitat Requirements	Likelihood of Occurrence on the Site
Black flying-fox	*Pteropus alecto*	NV	Sub-tropical forests and woodlands	Moderate
Common planigale	*Planigale maculata*	NV	Sclerophyll and rainforest vegetation	Moderate
Eastern tube-nosed bat	*Nyctimene robinsoni*	NV	Open forests	Moderate
Giant barred frog	*Mixophyes iteratus*	NE, CE	Terrestrial inhabitants of wet sclerophyll forest	Moderate
Grey headed flying fox	*Pteropus poliocephalus*	NV, CV	Eucalypt or paperbark forests for foraging or temporary/permanent	Moderate

[15] Gilmore, A.M. & Milledge, D.R. (1984) *Wildlife Survey of Mebbin Springs.* A report prepared for Hoffah Pty Ltd by A.M. Gilmore and Associates



Common Name	Species Name	Status*	Habitat Requirements	Likelihood of Occurrence on the Site
			roosts	
Koala	*Phascolarctos cinereus*	NV	Sclerophyll forest and woodland	Very High
Large-footed Myotis	*Myotis adversus*	NV	Near water in wet and dry sclerophyll forest and open woodland	Moderate
Little bentwing bat	*Miniopterus australis*	NV	Well-timbered areas including wet and dry sclerophyll forests	Moderate
Powerful Owl	*Ninox stenua*	NV	Eucalypt forests	Moderate
Red-tailed black cockatoo	*Calyptorhynchus banksii*	NV	Tall wet mountain forests	Moderate
Sooty owl	*Tyto tenebricosa*	NV	Tall wet eucalypt forest	Moderate
White-eared monarch	*Monarcha leucotis*	NV	Watercourse thickets	Moderate

* NE, NV = New South Wales (Endangered, Vulnerable) – *TSC Act*
CE, CV = Commonwealth (Endangered, Vulnerable) – *EPBC Act*

As previously stated, in Section 5.3, evidence of Koala habitat utilisation, in the form of characteristic scratch marks and scats were observed within the central and north-eastern extent of the site.

No other fauna species of significance pursuant to the *TSC Act* or *EPBC Act* or evidence of their habitat utilisation were recorded on or directly adjacent to the site during the field survey.

5.10 Overview

The disturbed nature of the majority of the site limits the availability of habitat resources for native fauna. However, the connective habitat associated with the Tweed River is considered, from an ecological standpoint, to be of importance as it provides native fauna with opportunities to disperse through and within the site. The small forest clumps within the site, whilst being relatively intact, provide habitat resources for only a limited range of native fauna species. Given the large expanse of more intact, contiguous and less disturbed habitat available within the surrounding locality, it is considered that the site does not provide habitat critical to the survival of any of the significant fauna species listed in Table 3.



6. PROPOSED DEVELOPMENT

The developer proposes the construction of the Nightcap Urban Village, which is envisaged to be a totally planned and designed village that is considerate of the surrounding environment.

The development would consist of:

- Village Lots;
- Village Housing precinct;
- Mixed Village precinct;
- Tourism and Special Uses areas;
- Open Space areas (Village Green, Sports Display, Market Garden);
- Environmental Open Space;
- two centrally located dams;
- Parking; and
- Rehabilitation Areas.

The layout of the proposed development is illustrated in Figure 4.

In order to provide the Nightcap Urban Village with a sufficient and reliable water supply, a series of pipelines would be constructed within dedicated easements located external to the site which provide linkages to water treatment and storage areas and potential irrigation areas. An indicative layout of the easement locations is provided in Appendix D of the Environment and Infrastructure Report prepared by Cardno. With respect to the proposed locations of the pipeline easements, the following is noted.

1. The actual alignments of the proposed easements would be finalised following collation and analyses of detailed site survey information.
2. The easements have been located so as to minimise the extent of vegetation necessary to establish the water pipelines. In this respect it is noted that:
    a. easements north of the site would generally traverse cleared paddocks, currently utilised for cattle grazing;
    b. the easement to the immediate west of the site would generally traverse a proposed Asset Protection Zone (refer to the Bushfire Management Plan prepared for the site by Cardno); and
    c. the future potential easement which runs west from the site would follow an existing dirt track which is regularly utilised by 4WD vehicles.
3. There will be a requirement for a pipeline to cross the Tweed River to the south-west of the site.

Further detail in respect of the above is provided within the Environment and Infrastructure Report prepared by Cardno.



From an ecological perspective key elements of the proposed development of the Nightcap Urban Village include the following.

1. The protection of the majority of native vegetation associated with the Tweed River, which traverses the site's southern extent within the Environmental Open Space Area. Under the proposed plan of development this existing riparian corridor is to be rehabilitated through the removal of existing weed infestations and the planting out of suitable endemic flora. In this respect, it is noted that the intent is to expand the current width of the riparian corridor through the planting out of native flora in areas that currently support pasture grasslands. Further detail in this respect is provided within the Rehabilitation Concept Plan prepared for the site by Cardno which is attached as Appendix C.

2. The protection of the small clump of Flooded gum open forest, which contains the Green-leaved rose walnut, within the proposed "Village Lots" section of the Nightcap Urban Village development footprint.

3. Retention of other native vegetation to the extent practicable whilst allowing for the orderly development of the site in accordance with its "*2(d) Village*" designation under the *Tweed LEP*.

4. The use of local species for landscaping and rehabilitation works to complement the functional value of areas of existing native vegetation. Where practicable, existing native trees would be incorporated into the landscaping of the proposed development.

5. The potential to exclude and/or limit the ownership of domestic pets.

In summary, the proposed plan of development incorporates various design elements specifically intended to preserve those areas of the site that possess the highest conservation value and to accommodate the enhancement of an existing wildlife corridor. It is acknowledged that additional investigations and plans will need to be completed as part of the ongoing planning and approval process associated with the site's development. In this regard, it is also acknowledged that further detailed consideration will need to be given to the design and application of measures which are to be implemented for the purpose of ensuring areas and aspects of significant functional ecological value within the site are appropriately managed. This will include, as part of the development's detailed design phase, the preparation of two management plans, namely a Threatened Species Management Plan and an Environmental Open Space Area Management Plan. These plans will be prepared to facilitate the appropriate and ongoing preservation and management of areas within the site that have significant functional ecological value. Further detail in respect of these plans is provided in Sections 6.1 and 6.2 below.

6.1 Threatened Species Management Plan

A Threatened Species Management Plan ("TSMP") would be prepared in support of the ongoing development application and approval process. The TSMP will provide guidance in relation to the management of threatened species known to occur on the site (i.e. the Green-leaved rose walnut and the Koala) prior to and during the construction and occupational phases of the proposed development. In this respect, the TSMP will, at a minimum, provide:



- management strategies specifically designed to provide appropriate protection during the construction and occupational phases of the proposed development for the patch of vegetation which supports the Green-leaved rose walnut specimen;
- details concerning methods of weed control within the patch of vegetation which supports the Green-leaved rose walnut specimen which are designed to reduced current infestations of exotic flora;
- details concerning any rehabilitation works, including information relevant to any enhancement plantings of native flora species, that would be undertaken within the patch of vegetation which supports the Green-leaved rose walnut specimen to promote native species diversity;
- the roles and responsibilities of relevant government and privately operated entities with respect to the ongoing management and conservation of the patch of vegetation which supports the Green-leaved rose walnut specimen;
- measures which would be taken to minimise any clearance of existing Koala food trees and avoid injury and harm to any Koala during selective vegetation clearance works;
- measures which would be taken to avoid injury or harm to Koalas on adjoining parcels of land during the proposed clearance works; and
- details concerning rehabilitation works that will be undertaken within the site to enhance the Koala habitat values of areas of the site that are to be retained and conserved for open space purposes.

6.2 Environmental Open Space Management Plan

An Environmental Open Space Area Management Plan ("EOSAMP") will be prepared in support of the ongoing development application and approval process. The EOSAMP will provide guidance in relation to the management of the proposed Environmental Open Space Area prior to and during the construction and occupational phases of the proposed development and will, in particular, focus upon:

- the management strategies required to appropriately rehabilitate, expand and protect the riparian communities associated with the Tweed River which are considered to be broadly analogous to two Endangered Ecological Communities listed under the provisions of the *TSC Act*; and
- enhancement of the site's Koala habitat values.

In this respect, the EOSAMP will, at a minimum, provide:

- details relevant to the future tenure and ownership for the Environmental Open Space Area;
- identification of any trustees associated with the Environmental Open Space Area;
- identification of administrative and management arrangements for the Environmental Open Space Area, including funding;



- the framework within which the Environmental Open Space Area is to be managed as part of the proposed village development;
- documentation of the Environmental Open Space Area's current ecological values;
- documentation of the management objectives for the Environmental Open Space Area;
- details concerning all re-vegetation and Koala habitat enhancement works to be undertaken within the Environmental Open Space Area, including, but not limited to, a list of appropriate plant species for utilisation within the works, appropriate planting densities, watering schedules and monitoring and maintenance programs;
- design and management provisions to assist the Environmental Open Space Area to become ecologically self-sustaining;
- management strategies specifically designed to ensure that the construction and occupation of the adjoining village does not adversely affect the current and future conservation values of the Environmental Open Space Area;
- details relating to on-going weed and erosion control and monitoring requirements including any provisions for any necessary remedial works within the Environmental Open Space Area;
- the incorporation of relevant management specifications contained within the Threatened Species Management Plan; and
- documentation of the roles and responsibilities of relevant government and privately operated entities with respect to the ongoing management and conservation of the Environmental Open Space Area.



7. COMPLIANCE WITH BIODIVERSITY CONSERVATION REGULATIONS

Development of the site is subject to constraints imposed by various regulations that give recognition to and specific management requirements for species, communities and aspects of significant biodiversity conservation value. The degree of compliance that the proposed development achieves with the purpose, intent and specific performance criteria of various regulations with a biodiversity conservation focus is considered below.

7.1 Environment Protection and Biodiversity Conservation Act 1999

The *EPBC Act* requires that a person must receive Commonwealth approval for any action that has, will have, or is likely to have a significant impact on matters of national environmental significance. Matters of national environmental significance that are recognised by the *EPBC Act* and which can act as a trigger for the Commonwealth assessment and approval process include:

- World Heritage properties;
- Ramsar wetlands of international significance;
- Nationally threatened species and communities;
- Migratory species protected under international agreements;
- Nuclear actions, including uranium mining; and
- The Commonwealth marine environment.

In respect of the above matters of national environmental significance recognised by the *EPBC Act*, it is noted that the site provides potential habitat resources for the Giant barred frog and Grey headed flying fox which are both listed threatened fauna species. The *EPBC Act* provides for the 'conservation of critical habitat' of listed threatened species. It is considered that the relevant and respective habitat resources for these species within the site (i.e. a section of the Tweed River fringed by a narrow corridor of vegetation, and scattered eucalypts and other forest trees) do not constitute habitat *critical* to the survival of either species.

No other matters of national environmental significance have been recognised within the site or its immediate surrounding locality.

The proposed development is compliant with the provisions of the *EPBC Act*.

7.2 *Native Vegetation Act 2003*

The objectives of the *Native Vegetation Act 2003* are to ensure the following aims are undertaken in accordance with the principles of ecologically sustainable development.

a. to provide for, encourage and promote the management of native vegetation on a regional basis in the social, economic and environmental interests of the State; and



b. to prevent broadscale clearing unless it improves or maintains environmental outcomes; and

c. to protect native vegetation of high conservation value having regard to its contribution to such matters as water quality, biodiversity, or the prevention of salinity or land degradation; and

d. to improve the condition of existing native vegetation, particularly where it has high conservation value; and

e. to encourage the revegetation of land, and the rehabilitation of land, with appropriate native vegetation;

Pursuant to Schedule 1, Part 3 of this regulation, land within a zone designated "residential" (but not "rural-residential"), "village", "township", "industrial" or "business" under an environmental planning instrument or, having regard to the purpose of the zone, having the substantial character of a zone so designated, not being land to which a property vegetation plan applies, is excluded from the operation of the *Native Vegetation Act 2003*.

As previously stated, the site has a "Village" designation pursuant to the *Tweed LEP* and, as such, any vegetation clearance within the site is exempt from the provisions of the *Native Vegetation Act 2003*. The provisions of the *Native Vegetation Act 2003* do not, therefore, constrain clearance of vegetation within the site.

7.3 *Threatened Species Conservation Act 1995*

The *Threatened Species Conservation Act 1995* ("*TSC Act*") outlines the protection of threatened species, communities and critical habitat in New South Wales. It provides for the identification, conservation and recovery of threatened species and their populations and communities. It also aims to reduce the threats faced by those species. The Act contains lists of threatened species, which are divided into several categories:

- species presumed extinct;
- endangered species;
- endangered populations;
- endangered ecological communities;
- vulnerable species; and
- vulnerable ecological communities.

The objects of this Act are as follows:

a. to conserve biological diversity and promote ecologically sustainable development, and

b. to prevent the extinction and promote the recovery of threatened species, populations and ecological communities, and

c. to protect the critical habitat of those threatened species, populations and ecological communities that are endangered, and



d. to eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities, and

e. to ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed, and

f. to encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

7.3.1 Threatened Wildlife Species

It is relevant to note that the following two species, listed respectively as *Endangered* and *Vulnerable* pursuant to the *TSC Act* were recorded within the site:

- Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*); and
- Koala (*Phascolarctos cinereus*).

The proposed plan of development will result in the clearance of some of the site's existing native vegetation. The clearing of native vegetation is listed in Schedule 3 of the *TSC Act* as a "key threatening process" to the survival or evolutionary development of a species, population or ecological community. It is relevant to note that, it will be necessary to prepare a Species Impact Statement (SIS) that addresses the potential impact of the key threatening process on the survival of the threatened species if:

a. the proposed vegetation clearance is to occur on land that is, or is part of, critical habitat declared under Part 3 of the *TSC Act*; and/or

b. the proposed vegetation clearance is likely to have a significant effect on threatened species, populations or ecological communities, or their habitats.

With respect to point (a) above, "critical habitat" is defined in the *TSC Act* as "*the whole or any part or parts of the area or areas of land comprising the habitat of an endangered species, population or ecological community or critically endangered species or ecological community that is critical to the survival of the species, population or ecological community is eligible to be declared under this Part to be the critical habitat of the species, population or ecological community.*" The site does not currently form part of an area of declared critical habitat for these species under Part 3 of the *TSC Act*.

The site is considered not to represent an area eligible to be declared as an area of critical habitat for either the Green-leaved rose walnut or the Koala for the reasons outlined below.

Green-leaved rose walnut

- The NSW National Parks and Wildlife Service's *Atlas of NSW Wildlife* identifies the distribution of this species as extending from the north-eastern coastline of NSW between Broken Head and Pottsville, north to the section of the Border Ranges that run between Kyogle and Numibah and south-west to the Washpool



National Park. It is also relevant to note that the species is also known to occur within south-east Queensland and has been recorded as far north as Mackay[16].

- The site is situated approximately in the middle of the species' range within NSW. In this respect, it is relevant to note that the specimen recorded within the site does not occur on the edge of the species' range nor does it represent a record outside the species' known distribution.

- The site occurs to the east of a large, contiguous tract of bushland similar in composition to that in which the specimen was recorded. It is reasonable to expect that if the Green-leaved rose walnut has persisted within a small forest clump retained amongst otherwise cleared land, then other specimens, and perhaps populations of the species, are likely to occur within the adjacent and expansive vegetation associations. In this respect it is noted that Gilmore and Milledge (1984)[17] recorded specimens of *E. muelleri* within closed forest (subtropical rainforest) on land adjoining the site to the west. Whilst it is acknowledged that these specimens may have belonged to what is now described as *E. muelleri* subsp. *muelleri*, and which is not listed under the provisions of the *TSC Act*, it is reasonable to expect given the close proximity of the specimen recorded within the site, that these specimens were in fact *E. muelleri* subsp. *bracteata*.

- The forest clump within which the specimen was recorded and the site itself are relatively small in size compared to adjacent areas of protected reserve which support similar vegetation associations and in which the Green-leaved rose walnut is known to occur. Protected reserves in the vicinity of the site include Mount Warning National Park, Border Ranges National Park and Mount Jerusalem National Park, Nightcap National Park and Mebbin National Park.

For the reasons give above, it is considered that the site does not represent an area of critical habitat for the Green-leaved rose walnut.

Koala

- As previously stated in Section 5.3, whilst, it is recognised that Koalas utilise habitat within the site, it is considered, given its sparse vegetative cover, high densities of Camphor laurel and relatively small size, in comparison to larger tracts of bushland in the locality, that the site represents a transitory habitat resource for this species rather than permanent habitat for a resident population. In this respect, the site does not represent a significant Koala habitat resource.

- To the east of the site is a large, contiguous tract of bushland which would provide the Koala with more suitable habitat than the fragmented, highly disturbed vegetation that occurs within the site.

- The Koala has a widespread distribution in sclerophyll forest and woodland and riverine forests in eastern Australia from approximately Chillagoe in northern Queensland to the Mt Lofty Ranges in South Australia. The NSW National Parks and Wildlife Service's *Atlas of NSW Wildlife* also identifies several Koala records

[16] Hauser, J. and Blok, J. (2002) *Fragments of Green: An Identification Field Guide for Rainforest Plants for the Greater Brisbane Region to the Border Ranges.* Australian Rainforest Conservation Society, Bardon Queensland.

[17] Gilmore, A.M. & Milledge, D.R. (1984) *Wildlife Survey of Mebbin Springs.* A report prepared for Hoffah Pty Ltd by A.M. Gilmore and Associates



from within the site locality including records from Mebbin Nature Reserve, Mt Warning National Park and Mt Jerusalum National Park. It is relevant to note that the *Atlas of NSW Wildlife* does not have any records of Koala from within the actual site.

- The site itself is relatively small in size compared to the protected reserves in the vicinity of the site which support intact vegetation such as Mount Warning National Park, Border Ranges National Park, Mount Jerusalem National Park, Nightcap National Park and Mebbin National Park.

In addition, the *TSC Act* also requires that the proposed plan of development is assessed against Section 94 (3) of the Act to determine whether the development is likely to have a significant effect on threatened species, populations or ecological communities, or their habitats. The relevant and applicable parts of Section 94 (3) (i.e. the "seven part test") are listed as follows.

a. *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*

b. *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction…*

c. *…In relation to the habitat of a threatened species, population or ecological community:*

   i. *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
   ii. *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
   iii. *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

e. *…Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).*

f. *Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.*

g. *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

In respect of the above and given the current habitat values of the site, it is considered that development would not have a significant effect on these threatened species or their habitats. In this regard, it is also relevant to note that, under the proposed plan of development:

- the patch of Flooded gum open forest in which the Green-leaved rose walnut specimen was recorded is to be conserved and retained amongst within the village;

- the riparian vegetation that fringes the Tweed River and which provides habitat and a movement corridor for the Koala is also to be conserved and retained within the proposed plan of development as illustrated in Figure 4;

- known Koala forage trees (e.g. *Eucalyptus tereticornis*, *E. propinqua* and *E. microcorys*) are to be incorporated into the revegetation of the riparian vegetation community associated with the Tweed River which, under the proposed plan of development, is to be enhanced and expanded and conserved within the Environmental Open Space Area; and



- the management specifications contained within the Threatened Species Management Plan, which is to be prepared in support on the ongoing development application and approval process and which is to provide guidance in relation to the management of the Green-leaved rose walnut and the Koala, will be implemented prior to and during the construction and occupational phases of the proposed development (further detail in this regard has been provided in Section 6.1 herein).

As such, a SIS for the site is not required as the site does not represent critical habitat to the above listed threatened species and the proposed plan of development is not likely to have a significant effect on the threatened species or their habitats.

7.3.2 Endangered Ecological Communities

The Riparian vegetation and Rainforest and Myrtaceae communities associated respectively with the Tweed River and a small drainage line in the north-east of the site are, from a conservative standpoint, considered to be broadly analogous to two Endangered Ecological Communities listed under the provisions of the *TSC Act*, namely:

- *Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion*; and
- *Sub-tropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion*.

With respect to the above, it is relevant to note that the Tweed Vegetation Management Strategy 2004[18] does not identify the presence of vegetation analogous to the *Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion* on or within the immediate vicinity of the site (refer *Vegetation Type: Map 2 of 7* within the Tweed Vegetation Management Strategy 2004).

The proposed plan of development will result in some clearance of these vegetation communities for the purposes of establishing a secondary access point to the site from the Uki-Kyogle Road and constructing village lots and associated infrastructure. The clearing of native vegetation is listed in Schedule 3 of the *TSC Act* as a "key threatening process" to the survival or evolutionary development of a species, population or ecological community. It is relevant to note that, it will be necessary to prepare a SIS that addresses the potential impact of the key threatening process on the survival of the threatened species if:

a. the proposed vegetation clearance is to occur on land that is, or is part of, critical habitat declared under Part 3 of the *TSC Act*; and/or

b. the proposed vegetation clearance is likely to have a significant effect on threatened species, populations or ecological communities, or their habitats.

With respect to point (a) above, "critical habitat" is defined in the *TSC Act* as "*the whole or any part or parts of the area or areas of land comprising the habitat of an*

[18] Kingston, M.B., Turnbull, J.W. and P.W. Hall (2004) *Tweed Vegetation Management Strategy 2004 Volume 3 of 3 – Appendices*. A report prepared for Tweed Shire Council by Ecograph: Ecological and Geographical Information Systems Consultants – Limpinwood, NSW



endangered species, population or ecological community or critically endangered species or ecological community that is critical to the survival of the species, population or ecological community is eligible to be declared under this Part to be the critical habitat of the species, population or ecological community." It is relevant to note that, at present, the site does not form part of an area of declared critical habitat for these species under Part 3 of the *TSC Act*.

In addition, the *TSC Act* also requires that the proposed plan of development is assessed against Section 94 (3) of the Act to determine whether the development is likely to have a significant effect on threatened species, populations or ecological communities, or their habitats. The relevant and applicable parts of Section 94 (3) (i.e. the "seven part test") are listed as follows.

c. ...In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

d. In relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and
ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and
iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

e. Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

f. Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

g. Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

It is considered that the proposed development would not have a significant effect upon either of the above listed Endangered Ecological Communities for the reasons outlined below.

1. Past and ongoing land uses of the site have resulted in a number of disturbances to the Riparian vegetation and Rainforest and Myrtaceae communities (refer Figure 3). The most significant of these, vegetation clearance, has greatly reduced the coverage and native floral diversity of these two communities and has facilitated the invasion and infestation of a number of noxious weeds, including Camphor laurel, Groundsel bush, Crofton weed, Lantana and Mistflower. As a consequence, the functional conservation and ecological values of both communities have been greatly reduced.

   Under the proposed plan of development (refer Figure 4), land within and adjacent to the Tweed River would be conserved and protected within the Environmental Open Space Area. The Environmental Open Space Area would encompass all of the Riparian vegetation community and the majority of the intact and largely undisturbed south-eastern portion of the Rainforest and Myrtaceae community. In this respect it is considered that the proposed development achieves compliance with the intent and purpose of Section 94 (3)(e) of the *TSC Act*.



2. As part of the proposed plan of development, much of the area that is to be contained within the Environmental Open Space Area and which is presently characterised by cleared land, will be revegetated with suitable native and endemic flora species. Such revegetation works would greatly expand the existing coverage of the Tweed River riparian vegetation corridor and would more would provide appropriate compensation for any loss which would occur as a result of establishing a secondary access point to the site from the Uki-Kyogle Road and the construction of village lots and associated infrastructure.

3. The approximate extents of the Riparian vegetation and Rainforest and Myrtaceae communities that would be removed under the proposed plan of development are 0.15ha and 0.6ha respectively. Such reductions in extents would not result in either community being placed at risk of extinction in the locality nor would it substantially or adversely modify the composition of either community such that their local occurrence would be placed at risk of extinction. In this regard, it is reiterated that, under the proposed plan of development, the current extents of these communities will be enhanced and expanded through the rehabilitation and revegetation of existing cleared land which would be contained within the Environmental Open Space Area. In this respect it is considered that the proposed development achieves compliance with the intent and purpose of Section 94 (3)(c) of the *TSC Act*.

4. The proposed plan of development would not significantly fragment or further isolate either the Riparian vegetation or Rainforest and Myrtaceae community. In this respect it is noted that:

    a. past land clearance events on the site and in the locality have reduced the extent of coverage of these and other native vegetation communities and have greatly influenced the current species composition through secondary impacts such as weed invasion;

    b. vegetation associated with the Tweed River would be wholly conserved within an Environmental Open Space Area; and

    c. the area that is to be contained within the Environmental Open Space Area, which is presently characterised by cleared land, will be revegetated with suitable native and endemic flora species and such an action would consolidate and enhance the current extent of both communities within the site.

    In this respect it is considered that the proposed development achieves compliance with the intent and purpose of Section 94 (3)(d) of the *TSC Act*.

5. As previously discussed in Section 5.8 herein, the riparian vegetation associated with the Tweed River represents the feature of greatest ecological importance within the site in terms of providing movement opportunities for native fauna. Under the proposed plan of development, the riparian corridor's current functional width would be expanded, providing dispersing wildlife with greater temporary shelter resources and resident fauna with increased foraging opportunities.

6. The proposed plan of development would implement the management specifications contained within the Environmental Open Space Area Management Plan. This Plan is to be prepared in support on the ongoing



development application and approval process, and is to provide guidance in relation to the management the management of the proposed Environmental Open Space Area prior to and during the construction and occupational phases of the proposed development. In particular, the Plan will focus upon the management strategies required to appropriately rehabilitate, expand and protect the riparian communities associated with the Tweed River (further detail in this regard has been provided in Section 6.2 herein).

As such, a SIS for the site is not required as the proposed plan of development is not likely to have a significant adverse effect on the vegetation communities considered to be broadly analogous to Endangered Ecological Communities under the provisions of the *TSC Act*.

7.4 *Environmental Planning and Assessment Act 1979*

This Act provides a system of environmental planning and assessment for New South Wales. The objects of this Act include "*the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, ecologically sustainable development* and *the proper management, development and conservation of natural and artificial resources*."

In respect to the proposed plan of development, as per the *TSC Act*, there is a requirement to assess whether there is likely to be any significant effects on threatened species, populations or ecological communities, or their habitats as a result of the proposed development.

As previously stated, it is considered that development would not have a significant effect on these threatened species or their habitats and, as such, a SIS is not required as part of the development application for:

- the Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*) and Koala (*Phascolarctos cinereus*), which are respectively listed as *Endangered* and *Vulnerable*; or
- the vegetation communities associated with the Tweed River and a small drainage line in the north-east of the site which are broadly analogous to listed Endangered Ecological Communities.

7.5 *Fisheries Management Act 1994*

The objects of the *Fisheries Management Act 1994* are to conserve and manage the fishery resources of NSW. Key objectives include to conserve key fish habitats and fish stocks, promote ecologically sustainable development and to conserve threatened species, populations and ecological communities of fish and marine vegetation.

The relevant key threatening processes that are listed under Schedule 6 of the *Fisheries Management Act* are detailed below.

1. *Degradation of native riparian vegetation along New South Wales water courses.*
2. *Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams.*
3. *Introduction of fish to waters within a river catchment outside their natural range.*
4. *Removal of large woody debris from New South Wales rivers and streams.*



As part of the proposed plan of development, to gain access into the site two waterway (Tweed River) crossings are proposed, as illustrated in Figure 4, one of which has previously been constructed. In this respect, if any works are required within the Tweed River that may be defined as reclamation works or dredging works, a permit would be required as Section 201 of Part 7: Protection of aquatic habitats, Division 3 which states that:

201 Circumstances in which a person may carry out dredging or reclamation work

(1) A person must not carry out dredging or reclamation work except under the authority of a permit issued by the Minister.

Maximum penalty: In the case of a corporation, 2,000 penalty units or, in any other case, 1,000 penalty units.

(2) This section does not apply to:
(a) work authorised under the Crown Lands Act 1989, or
(b) work carried out, or authorised, by a relevant public authority (other than a local government authority), or
(c) work excluded from the operation of this section by the regulations.

In this respect, the following terms are defined pursuant to Division 3, Section 198A of the Act:

- ***dredging work*** *means:*

  (a) any work that involves excavating water land, or
  (b) any work that involves the removal of material from water land that is prescribed by the regulations as being dredging work to which this Division applies.

- ***farm dam*** *means the backed up waters of any dam, or impoundment, located on land that is not public water land.*

- ***reclamation work*** *means any work that involves:*

  (a) using any material (such as sand, soil, silt, gravel, concrete, oyster shells, tyres, timber or rocks) to fill in or reclaim water land, or
  (b) depositing any such material on water land for the purpose of constructing anything over water land (such as a bridge), or
  (c) draining water from water land for the purpose of its reclamation.

- ***water land*** *means land submerged by water:*

  (a) whether permanently or intermittently, or
  (b) whether forming an artificial or natural body of water,
  and includes wetlands and any other land prescribed by the regulations as water land to which this Division applies.

Consideration of Section 219 of the Act: Passage of fish not to be blocked, is also required to respect to the waterway crossings as:

(1) A person who:
(a) sets a net, netting or other material, or
(b) constructs or alters a dam, floodgate, causeway or weir, or
(c) otherwise creates an obstruction,
across or within a bay, inlet, river or creek, or across or around a flat, so that:
(d) fish will or could be blocked or left stranded, or
(e) immature fish will or could be destroyed, or
(f) the free passage of fish will or could be obstructed,
is guilty of an offence.



(5) *This section does not apply to or in respect of the following:*

(a) any activity that is otherwise permitted by or under this Act or any other Act,

(b) any activity that is done in accordance with a permit issued by the Minister under this Part,

(c) any activity or waters of a kind exempted from the operation of this section by the regulations.

With respect to the above, it is relevant to note that the proposed development would involve the upgrade of an existing roadway crossing of the Tweed River and the construction of an additional roadway crossing and it is recognised that these works may require approval under Part 7 (Division 3) of the *Fisheries Management Act 1994*. In addition, and as noted in Section 6, there will also be a need to construct a water pipeline across the Tweed River to the south-west of the site. It is recognised that the construction of this pipeline may, like the roadway crossings, require approval under Part 7 (Division 3) of the *Fisheries Management Act 1994*.

With respect to the above, it is noted that the design and construction of these crossings would need to be undertaken in accordance with the NSW Fisheries' *Policy and Guidelines for Fish Friendly Waterway Crossings*. As such, the proposed plan of development would be constrained by the provisions of the *Fisheries Management Act 1994* and its associated policies and guidelines.

7.6 *Rivers and Foreshores Improvement Act 1948*

The *Rivers and Foreshores Improvement Act 1948* provides for the protection of the banks and land adjoining waterways and the prevention of erosion. In respect to the proposed plan of development, a "Part 3A Permit" under the *Rivers and Foreshores Improvement Act 1948* would be required for any excavation works, removal of material, or works that may obstruct or detrimentally affect the flow of protected waters in or within 40m from the top of the bank of any protected waters (i.e. the Tweed River).

Pursuant to Part 3A of the Act:

- ***protected land*** *means:*

  (a) land that is the bank, shore or bed of protected waters, or

  (b) land that is not more than 40 metres from the top of the bank or shore of protected waters (measured horizontally from the top of the bank or shore), or

  (c) material at any time deposited, naturally or otherwise and whether or not in layers, on or under land referred to in paragraph (a) or (b).

- ***protected waters*** *means a river, lake into or from which a river flows, coastal lake or lagoon (including any permanent or temporary channel between a coastal lake or lagoon and the sea).*

- *Permit required for excavation etc*

(1) *A person must not:*

(a) make an excavation on, in or under protected land, or

(b) remove material from protected land, or

(c) do anything which obstructs, or detrimentally affects, the flow of protected waters, or which is likely to do so,

unless the person is either authorised to do so by a permit under this Part and does so in accordance with any conditions to which the permit is subject, or is authorised to do so by the regulations.



With respect to the above, it is relevant to note that the proposed development would involve the establishment of a new roadway crossing, the upgrade of an existing roadway crossing and the establishment of a pipeline crossing of the Tweed River. Such works are likely to require a permit issued under Part 3A of the *Rivers and Foreshores Improvement Act 1948*.

7.7 SEPP 44 – Koala Habitat Protection

SEPP 44 aims to manage and conserve natural vegetation that provides habitat for Koalas. According to SEPP 44, this is to be achieved:

a) by requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat, and

b) by encouraging the identification of areas of core koala habitat, and

c) by encouraging the inclusion of areas of core koala habitat in environment protection zones.

"Core koala habitat" is defined in the policy as "*an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population*".

Despite the fact that no direct sightings of Koalas were recorded within the site or directly adjacent to it during field surveys, it is relevant to note that characteristic Koala (*Phascolarctos cinereus*) scratch marks, of an indeterminable age, were recorded on several *Eucalyptus propinqua* within the north-eastern extent of the site and characteristic Koala scats were collected from the base of an *E. microcorys* to the north of the site's central knoll. It is also relevant to note that the detailed fauna survey completed by Gilmore and Milledge[19] between the 4th and 21st March 1984 within the adjacent Mebbin Springs site recorded "only three Koalas".

Whilst, it is recognised that Koalas utilise habitat within the site, it is considered that, given its sparse vegetative cover, high densities of Camphor laurel and relatively small size, in comparison to larger tracts of bushland in the locality, the site is likely to represent a transitory habitat resource for this species rather than permanent habitat for a resident population. In this respect, the site does not represent or satisfy the definition of a core Koala habitat resource provided within the SEPP 44.

"Potential Koala Habitat" is defined in the policy as "*areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component*". In this respect it is noted that the site contains two species listed in Schedule 2 of SEPP 44, namely Forest red gum (*Eucalyptus tereticornis*) and Tallowwood (*E. microcorys*). These two species are represented by a few, widely scattered individuals. It is also noted that neither of the tree species is a dominant or co-dominant in any of the vegetation associations described in Sections 4.2.1 - 4.2.8. In this respect, these species would not constitute 15% of the total number of trees in the upper or lower strata of the tree component of

[19] Gilmore, A.M. & Milledge, D.R. (1984) *Wildlife Survey of Mebbin Springs*. A report prepared for Hoffah Pty Ltd by A.M. Gilmore and Associates.



any of the vegetation associations present within the site. As such, the site does not represent an area of potential Koala habitat as defined by SEPP 44.

Notwithstanding the above, it is relevant to note that under the proposed plan of development various measures will be taken to avoid adverse impacts to Koala and to effect a net enhancement of the site's Koala habitat values and linkage functions. In this respect the proposed plan of development makes provision for the following.

1. Existing Koala food trees located on the site would be retained to the extent practicable whilst allowing for the orderly development of the site in accordance with its "2(d) Village" designation under the Tweed LEP.

2. Riparian vegetation associated with the Tweed River, which represents important habitat and a movement corridor for the Koala, is to be conserved and enhanced via the removal of weed species and planting of suitable, native and endemic flora, including Koala food species. Further detail in this respect is provided in Appendix C.

3. The preparation and implementation of a TSMP which will contain management strategies designed to minimise the risk of harm or injury to Koalas during vegetation clearance activities undertaken within the site. The TSMP will be designed to achieve the outcomes of the New South Wales National Parks and Wildlife Service's (February 2003) *Draft Recovery Plan for the Koala (Phascolarctos cinereus)* and will focus upon the following specific objectives of the Draft Plan:

    a. <u>Objective 1</u>: To conserve koalas in their existing habitat.

    b. <u>Objective 2</u>: To rehabilitate and restore koala habitat and populations.

    c. <u>Objective 4</u>: To ensure that the community has access to factual information about the distribution, conservation and management of koalas at a national, state and local scale.

    d. <u>Objective 5</u>: To manage captive, sick or injured koalas and orphaned wild koalas to ensure consistent and high standards of care.

7.8 *Tweed Local Environment Plan 2000* and Development Control Plan No 16 – Subdivision Manual

The Development Control Plan ("DCP") No. 16 – Subdivision Manual of the Tweed Shire Council has been prepared in accordance with the *Environmental Planning and Assessment Act 1979* and provides guidelines on designing and the overall planning of subdivision developments, including more specific design guidelines and development standards in respect to urban and rural subdivisions. The aims and purposes of this DCP include, *to present Council's strategic plan objectives for the development of subdivisions*, *to achieve the highest quality and "best practice" of subdivision development in the Shire* and *to implement the policies and provisions of the NSW State Government in terms of seeking to achieve quality of subdivision planning and development.*

The relevant section of the DCP in respect to the proposed plan of development is Chapter 4 – Urban Subdivision Design Guidelines and Development Standards. Within



this chapter are listed physical constraints that need to be addressed in respect to development, such as bushfire, threatened species, Koala habitat, significant vegetation and waterways. These relevant issues in respect to the proposed development are addressed individually below.

7.8.1 Bushfire

This issue has been addressed in the Bushfire Management Plan prepared for the site by Cardno. In summary:

- the site is bordered by vegetation analogous to that described for Vegetation Groups 1 and 3 in Table A2.1 of the New South Wales Rural Fire Service's *Planning for Bushfire Protection: A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners* ("the RFS Guide");

- under the proposed plan of development the intent is to retain clumps of forest trees and the site's riparian corridor, and that these communities are analogous to Vegetation Group 3;

- Asset Protection Zones ("APZs") need to be established around the inner perimeter of the site and along the edges of those areas of vegetation that are to be retained;

- additional bushfire management measures, relevant to buildings and structures, access, water supply, landscaping and general maintenance duties are recommended to mitigate against potential bushfire risk.

7.8.2 Threatened species, populations or ecological communities or their habitats

Two threatened species were recorded on the site during field surveys. These are the Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*) and the Koala (*Phascolarctos cinereus*), which are listed as *Endangered* and *Vulnerable* respectively pursuant to the *TSC Act*.

The DCP states that proposed subdivisions and associated subdivisions works must be assessed in accordance with section 5A of the *Environmental Planning and Assessment Act 1979*. This section of the Act addresses the issue of whether there will be a significant effect on threatened species, population or ecological communities, or their habitats. This issue has been discussed previously in Sections 7.3 and 7.4.

In summary:

- the site does not currently form part of an area of declared critical habitat for these species under Part 3 of the *TSC Act*;

- the site is considered not to represent an area eligible to be declared as an area of critical habitat for either the Green-leaved rose walnut or the Koala;

- the proposed development would not have a significant effect on these threatened species or their habitats; and

- given the above, a SIS is not required as part of the development application for either of the above listed threatened species.



7.8.3 Koala Habitat

This issue has been previously discussed in Sections 5.3, 7.3.1 and 7.7.

In summary:

- the site represents a transitory habitat resource for this species rather than permanent habitat for a resident population and, as such, the site does not represent a significant Koala habitat resource;
- existing Koala food trees located on the site would be retained to the extent practicable whilst allowing for the orderly development of the site in accordance with its "2(d) Village" designation under the Tweed LEP;
- under the proposed plan of development, riparian vegetation associated with the Tweed River, which represents important habitat and a movement corridor for the Koala is to be conserved and enhanced; and
- a Threatened Species Management Plan, containing management strategies specifically designed to minimise the risk of harm or injury to Koalas during vegetation clearance activities undertaken within the site, would be implemented as part of the development.

7.8.4 Significant Vegetation

Riparian vegetation is defined within the DCP as being significant vegetation. The riparian vegetation that fringes the Tweed River within the site is to be retained and conserved within the proposed plan of development as illustrated in Figure 4. It is relevant to note however, that the riparian corridor is relatively narrow due to the extent of past land clearance events.

The Tweed Vegetation Management Strategy 2004 has mapped various sectors of vegetation within the site as having a Very High or High Ecological Status. Field surveys however, identified that the majority of the site and mapped areas have been previously cleared and is currently dominated by grassland with scattered trees as illustrated in the Figure 2. Vegetation communities within the site that are recognised as having ecological significance are the riparian vegetation as discussed above and the Flooded gum (*Eucalyptus grandis*) open forest community in the north of the site. This latter community is significant as the *Endangered* Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*) was recorded within this community. The vegetation across the balance of the land is not considered to be significant vegetation due to its highly disturbed state and fragmented nature.

It is relevant to note that, under the proposed plan of development the forest clump in which the *Endangered* Green-leaved rose walnut was recorded would be retained and conserved. It is also relevant to note that the site's most important ecological feature (i.e. the riparian corridor that extends along the Tweed River) would also be retained and conserved. Retained areas of vegetation would be rehabilitated through the removal of recognised weed species and, where relevant, the planting out of suitable, native and endemic plant species. Landscaping of open space areas within the site would also be undertaken. Further detail in this respect is provided in Appendix C.



7.8.5 Waterways

The DCP states that development in or adjacent to waterways, water bodies, wetlands or within their catchments must provide a riparian buffer of 50m along major streams including the Tweed River and that native vegetation should be conserved surrounding waterways, water bodies, wetlands by the retention of riparian buffers. In this respect, as the Tweed River traverses the southern sectors of the site, a 50m buffer between the development envelope and the river is recommended.

Under the proposed plan of development, the riparian corridor that extends along the Tweed River would be retained and conserved and rehabilitated through the removal of recognised weed species and, where relevant, the planting out of suitable, native and endemic plant species. Further detail in this respect is provided in Appendix C. It is also relevant to note that the proposed development would involve the upgrade of an existing roadway crossing of the Tweed River, the construction of an additional roadway crossing and a pipeline crossing. It is recognised that these works may require approval under Part 7 (Division 3) of the *Fisheries Management Act 1994* and under Part 3A of the *Rivers and Foreshores Improvement Act 1948*. It is acknowledged that the design and construction of these crossings would need to be undertaken in accordance with the NSW Fisheries' *Policy and Guidelines for Fish Friendly Waterway Crossings*.



8. CONCLUSION

This assessment of the ecological values of the site for the proposed village development has been carried out for a number of purposes including:

- to document the ecological values of the site and specific areas thereof;
- to identify constraints to site development associated with the presence of areas and aspects of ecological significance as defined by reference to relevant State and Commonwealth government regulations; and
- to assess the degree of compliance that the proposed plan of development achieves with the requirements of the local planning scheme and relevant Commonwealth and State government legislation with a biodiversity conservation focus.

The conclusions of this assessment are as follows.

1. The site has a "2(d) Village" designation pursuant to the *Tweed LEP*, a designation which is classified as a "Residential" area under the *Tweed LEP*. Vegetation within the site is represented by riparian vegetation lining the Tweed River, isolated and small clumps of trees and large areas of highly disturbed vegetation dominated by pasture grasses and scattered trees. The predominantly disturbed nature of the majority of the site limits the availability of habitat resources for native fauna. The connective habitat associated with the Tweed River is, however, considered from an ecological standpoint, to be of importance as it provides native fauna with opportunities to disperse through and within the site and to move between broader areas of suitable habitat upstream and downstream of the site. The small forest clumps within the site are relatively intact and provide habitat resources for only a limited range of native fauna species.

2. Significant wildlife species and ecological communities recorded on and adjacent to the site during field surveys included the following.

   a. A specimen of Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*), which is listed as *Endangered* pursuant to the *TSC Act*, within a Flooded gum open forest clump in the north of the site.

   b. Evidence of Koala (*Phascolarctos cinereus*) habitat utilisation, a species listed as *Vulnerable* pursuant to the *TSC Act*, in the form of characteristic scratch marks and scats were observed within the central and north-eastern extent of the site.

   c. Two vegetation communities associated with the Tweed River which were considered to be broadly analogous to two Endangered Ecological Communities listed under the provisions of the *TSC Act*, namely:

      i. *Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion*; and

      ii. *Sub-tropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion.*



3. The proposed plan of development is for the construction of an Urban Village, which would consist of: village lots, a village housing precinct, a mixed village precinct, tourism and special use areas, open space areas (e.g. village green, sports display and market garden), environmental open space, two centrally located dams, a parking area and rehabilitation areas. The proposed plan of development would also result in the construction of a second roadway crossing and pipeline crossing of the Tweed River. From an ecological perspective key elements of the proposed development include the following.

    a. The protection of the majority of vegetation associated with the Tweed River within the Environmental Open Space Area. Under the proposed plan of development this existing riparian corridor is to be rehabilitated through the removal of existing weed infestations and the planting out of suitable endemic flora. In this respect, it is noted that the intent is to expand the current width of the riparian corridor through the planting out of native flora in areas that currently support pasture grasslands.

    b. The protection of the clump of Flooded gum open forest, which contains the Green-leaved rose walnut specimen.

    c. Retention of other native vegetation to the extent practicable whilst allowing for the orderly development of the site in accordance with its "2(d) Village" designation under the Tweed LEP.

    d. The use of local species for landscaping and rehabilitation works to complement the functional value of areas of existing native vegetation and fauna habitat.

    e. The potential to exclude and/or limit the ownership of domestic pets.

    f. Implementation of two management plans, namely a Threatened Species Management Plan ("TSMP") and an Environmental Open Space Area Management Plan ("EOSAMP"), which will facilitate the appropriate and ongoing preservation and management of those areas of the site recognised as having high conservation value.

4. The proposed plan of development gives regard to and is generally compliant with the provisions of various applicable Commonwealth, State and Local government regulations with a biodiversity conservation focus. In this respect the following is noted.

    a. The proposed plan of development would not be likely to have a significant impact on any Matters of National Environmental Significance pursuant to the provisions of the Commonwealth's *EPBC Act*.

    b. The site has a "2(d) Village" designation pursuant to the *Tweed LEP* and, as such, vegetation clearance within the site is exempt from the provisions of the *Native Vegetation Act 2003*.

    c. The site does not currently form part of an area of declared critical habitat under Part 3 of the *TSC Act* for either the Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*) and the Koala (*Phascolarctos cinereus*) and the site is considered not to represent an area eligible to be declared as an area of critical habitat for either of these species. Given the existing habitat values of the site, it is considered that development would not



have a significant effect on these threatened species or their habitats and, as such, a SIS is not required as part of the development application. In this respect it is relevant to note that as part of the proposed development:

i. the forest clump in which the *Endangered* Green-leaved rose walnut was recorded would be retained, conserved and managed in accordance with the specifications of the TSMP which is to be implemented as part of the development;
ii. disturbance to existing Koala food trees would be avoided to the extent practicable, the overall abundance of Koala food trees on the site would be increased and specific strategies would be implemented to avoid harm or injury to Koalas during selective vegetation clearance works; and
iii. the site's most important ecological feature (i.e. the riparian corridor that extends along the Tweed River), which provides habitat and a movement corridor for Koalas, would also be conserved and enhanced within the Environmental Open Space Area.

d. The riparian vegetation assemblages associated with the Tweed River and which are considered to be broadly analogous to Endangered Ecological Communities listed under the *TSC Act* would be wholly conserved and protected within the Environmental Open Space Area. In this regard it is relevant to note that as part of the proposed plan of development much of the area that is to be contained within the Environmental Open Space Area is presently characterised by cleared land which is to be revegetated with suitable native and endemic flora species. Such revegetation works would greatly expand the existing coverage of the Tweed River riparian vegetation corridor (and its associated Endangered Ecological Communities) and would compensate for any unavoidable loss of vegetation which would occur as a result of the proposed development of the site as an Urban Village. The EOSAMP, which is to be implemented as part of the development, would provide guidance in relation to the management of the proposed Environmental Open Space Area prior to and during the construction and occupational phases of the proposed development. In particular the EOCAMP will focus upon the management strategies required to appropriately rehabilitate, expand and protect the riparian communities associated with the Tweed River. In this regard, a SIS is not required as the proposed plan of development is not likely to have a significant adverse effect on the vegetation communities within and adjacent to the site that are considered to be broadly analogous to Endangered Ecological Communities under the provisions of the *TSC Act*.

e. The proposed development would involve the upgrade of an existing roadway crossing of the Tweed River and the construction of an additional crossing. It is recognised that these works may require approval under Part 7 (Division 3) of the *Fisheries Management Act 1994* and under Part 3A of the *Rivers and Foreshores Improvement Act 1948*. It is acknowledged that in order for the works associated with these crossings to have a reasonable chance of obtaining approval under these two Acts, their design and construction would need to be undertaken in accordance with the NSW Fisheries' *Policy and Guidelines for Fish Friendly Waterway Crossings*.

f. With respect to the relevant provisions of SEPP 44, the following points are noted.



i. The site represents a transitory habitat resource for Koala rather than permanent habitat for a resident population and, as such, the site does not represent core Koala habitat or a significant Koala habitat resource.

ii. The site contains two species listed in Schedule 2 of SEPP 44, namely Forest red gum (*Eucalyptus tereticornis*) and Tallowwood (*E. microcorys*). These two species are represented by a few, widely scattered individuals. These species constitute less than 15% of the total number of trees in the upper or lower strata of the tree component within the site. As such, the site does not represent an area of potential Koala habitat as defined in SEPP 44.

iii. Under the proposed plan of development, riparian vegetation associated with the Tweed River, which represents important habitat and a movement corridor for the Koala is to be conserved and its Koala habitat values enhanced. Details in this regard would be provided within the EOSAMP.

iv. The TSMP, to be implemented as part of the development, will contain management strategies designed to minimise the risk of harm or injury to Koalas during vegetation clearance activities undertaken within the site.

h. It is generally considered that the proposed plan of development achieves compliance with the purpose and intent of the *Tweed LEP* and the DCP as it relates to bushfire, threatened species, populations, ecological communities or their habitats, Koala habitat, significant vegetation and waterways.



N

LEGEND

——— Cadastral boundaries

60 0 60 120 180 240 300m
1:6000

Scale 1:6000 (A4)

FIGURE 2
AERIAL PHOTOGRAPH

Rev: Orig. Date: 15 June 2006

Project No.: 3500/53

Peter Van Lieshout
CAD FILE: I:\3500-53\ACAD\Ecological Assesment\Figure 2 - Aerial Photograph.dwg
XREF's:

PRINT DATE: 15 June, 2006 - 4:06pm



N

LEGEND

- Cadastral boundaries
- 1 Brush box (*Lophostemon confertus*) open forest
- 2 Flooded gum (*Eucalyptus grandis*) open forest
- 3 Flooded gum ± Brush Box ± Pink Bloodwood (*Corymbia intermedia*) open forest complex
- 4 Hoop pine (*Araucaria cunninghamii*) open forest
- 5 Rainforest and Myrtaceae complex
- 6 Mixed species open forest
- 7 Riparian vegetation
- 8 Cleared land

50 0 50 100 150 200 250m
1:5000

Scale 1:5000(A3)

FIGURE 3
VEGETATION COMMUNITIES

Rev: Orig. Date: 15 June 2006

Project No.: 3500/53

Peter Van Lieshout
CAD FILE I:\3500-53\ACAD\Ecological Assessment\Figure 3 - Vegetational Communities.dwg
XREF's

PRINT DATE 15 June, 2006 - 4:05pm



CONCEPT PLAN

TO MEBBIN NATIONAL PARK

DAM 2

DAM 1

PUMP STATION

VILLAGE GREEN

VILLAGE OVAL

MARKET GARDEN

ENVIRONMENTAL OPEN SPACE

TWEED RIVER

P

LEGEND

- VILLAGE LOTS
- VILLAGE HOUSING
- MIXED VILLAGE
- TOURISM AND SPECIAL USES
- OPEN SPACE (Village Green, Sports Display, Market Garden)
- ENVIRONMENTAL OPEN SPACE
- REHABILITATION AREA
- PARKING
- SITE BOUNDARY
- RIVER CORRIDOR

Image Sourced from: Malcolm Middleton Architects Pty Ltd

Scale N.T.S

FIGURE 4

PROPOSED PLAN OF DEVELOPMENT

Rev: Orig. Date: 30 June 2006

Project No.: 3500/53

Peter Van Lieshout



APPENDIX A

Plant Species Recorded Within the Site



Family	Botanical Name	Common Name
Adiantaceae		
	Adiantum hispidulum	Rough maidenhair fern
Agavaceae		
	Cordyline petiolaris	Broad-leaf palm lily
	Ripogonum elseyanum	Hairy supplejack
	Smilax australis	Austral sarsaparilla
Araucariaceae		
	Araucaria bidwillii	Bunya pine
	Araucaria cunninghamii	Hoop Pine
Asteraceae		
	*Ageratina adenophora**	Crofton weed
	*Ageratina riparia**	Mistflower
	*Ageratum houstonianum**	Blue billygoat weed
	*Baccharis halimifolia**	Groundsel
	*Bidens pilosa**	Cobblers peg
	Ozothamnus diosmifolius	Rice flower
Basellaceae		
	*Anredera cordifolia**	Madeira vine
Blechnaceae		
	Blechnum sp.	-
Caesalpiniaceae		
	Senna pendula var. *glabrata**	Easter cassia
Cunconiaceae		
	Caldcluvia paniculosa	Soft corkwood
Cyperaceae		
	Gahnia aspera	Sawsedge
Dennstaedtiaceae		
	Pteridium esculentum	Bracken
Dicksoniaceae		
	Calochlaena dubia	Soft bracken
Elaeocarpaceae		
	Elaeocarpus obovatus	Hard quandong
Epacridaceae		
	Trochocarpa laurina	Tree heath
Euphorbiaceae		
	Alchornea ilicifolia	Native holly
	Breynia oblongifolia	Coffee bush
	Macaranga tanarius	Macaranga
	Mallotus philippensis	Red kamala
Fabaceae		
	Castanospermum australe	Black bean
	Hovea acutifolia	Pointed-leaf hovea
	Kennedia rubicundra	Red kennedy pea
Flindersiaceae		
	Flindersia australis	Crows ash
	Flindersia bennettiana	Bennett's ash
Lauraceae		
	*Cinnamomum camphora**	Camphor laurel
	Cryptocarya glaucescens	Jackwood
	Cryptocarya obovata	Pepperberry ash
	Endiandra muelleri subsp. *bracteata*^	Green-leaved rose walnut
Liliaceae		
	*Asparagus plumosus**	Climbing asparagus
Lomandraceae		
	Lomandra hystrix	-
	Lomandra longifolia	-



Meliaceae		
	Melia azedarach	White cedar
Menispermaceae		
	Stephania japonica	Snake vine
Mimosaceae		
	Acacia implexa	Lightwood
	Acacia irrorata	Green wattle
	Acacia maidenii	Maiden's wattle
	Archidendron grandiflorum	Laceflower tree
Moraceae		
	Ficus fraseri	Sandpaper fig
	Ficus sp.	Fig
	Maclura cochinchinensis	Cockspur thorn
Myrsinaceae		
	Rapanea variabilis	Muttonwood
Myrtaceae		
	Acmena smithii	Lilly pilly
	Archirhodomyrtus beckleri	Rose myrtle
	Callistemon salignus	White bottlebrush
	Callistemon viminalis	Weeping bottlebrush
	Corymbia intermedia	Pink bloodwood
	*Corymbia torelliana**	Cadaghi
	Decaspermum humile	Silky myrtle
	Eucalyptus grandis	Flooded gum
	Eucalyptus microcorys	Tallowwood
	Eucalyptus propinqua	Small fruited grey gum
	Eucalyptus siderophloia	Grey Ironbark
	Eucalyptus tereticornis	Forest red gum
	Gossia hillii	-
	Pilidiostigma glabra	Plum myrtle
	Rhodamnia rubescens	Scrub turpentine
	Rhodomyrtus psidioides	Native guava
	Syncarpia glomulifera	Turpentine
	Syzygium oleosum	Blue lilly pilly
	Tristaniopsis laurina	Water gum
Oleaceae		
	*Ligustrum lucidum**	Broad leaved privet
	Notelaea longifolia forma *glabra*	Long-leaved mock olive
Passifloraceae		
	Passiflora subpeltata	White passion flower
Phytolaccaceae		
	*Phytolacca octandra**	Inkweed
Pittosporaceae		
	Pittosporum undulatum	Sweet pittosporum
Poaceae		
	Cymbopogon refractus	Barbed wire grass
	Imperata cylindrical	Blady grass
	Paspalum sp.*	-
Proteaceae		
	Grevillea robusta	Silky oak
	Helicia ferruginea	Rusty helicia
	Macadamia tetraphylla#	-
	Persoonia conjuncta	-
Rhamnaceae		
	Alphitonia excelsa	Red ash
Rutaceae		
	Acronychia pauciflora	Soft acronychia
	*Citrus limon**	Bush lemon



	Melicope micrococca	White doughwood
	Zieria smithii	Sandfly zieria
Sapindaceae		
	Cupaniopsis anacardiodes	Tuckeroo
	Cupaniopsis flagelliformis var. *australis*	Brown tuckeroo
	Diploglottis australis	Native tamarind
	Guioa semiglauca	Guioa
	Jagera pseudorhus	Foambark
	Sarcopteryx stipata	Steelwood
Sapotaceae		
	*Diospyros kaki**	Persimmon
Solanaceae		
	*Solanum mauritianum**	Wild tobacco
	*Solanum nigrum**	Blackberry nightshade
	*Solanum seaforthianum**	Climbing nightshade
Sterculiaceae		
	Seringia arborescens	-
Ulmaceae		
	Trema tomentosa	Poison peach
Verbenaceae		
	*Lantana camara**	Lantana
Vitaceae		
	Cissus antarctica	Kangaroo vine

* Introduced species
^ Species listed under the provisions of the *Threatened Species Conservation Act 1995*
Cultivated species



APPENDIX B

Descriptions of Endangered Ecological Communities

Sourced and adapted from the NSW's Department of Environment and Conservation website on the 12th July 2006 - http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx



LOWLAND RAINFOREST ON FLOODPLAIN - PROFILE

Scientific name: *Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion*
Conservation status in NSW: Endangered Ecological Community

Description

Lowland Rainforest on Floodplain is a rainforest community which now occurs only as small remnants in scattered localities on the NSW north coast, with less than 1000ha in total thought to remain. Larger stands of the community typically have a dense canopy, which blocks most light from reaching the ground, creating cool, moist conditions within. Lowland Rainforest on Floodplain supports a rich diversity of plants and animals. Typical tree species in the community include figs (*Ficus macrophylla*, *F. obliqua* and *F. watkinsiana*), palms (*Archontophoenix cunninghamiana* and *Livistona australis*), Silky Oak (*Grevillea robusta*), Black Bean (*Castanospermum australe*) and Brush Cherry (*Syzygium australe*). Animals present include fruit-eating rainforest pigeons, Noisy Pitta, Brush-turkey, pademelons, flying foxes, the Land Mullet skink and rainforest snails.

Location and habitat

Distribution

The NSW north coast

Habitat and ecology

This community occurs on fertile soils in lowland river valleys.

Regional information

This species is found in the Hunter/Central Rivers and Northern Rivers management authority regions.

References

NSW NPWS (2002). Threatened Species of the Upper North Coast of NSW: Flora. NSW NPWS, Coffs Harbour, NSW.

"NSW Scientific Committee (1999) Lowland rainforest on floodplain in the NSW North Coast Bioregion - Endangered ecological community determination - final. DEC (NSW), Sydney."



SUB-TROPICAL COASTAL FLOODPLAIN FOREST - PROFILE

Scientific name: *Sub-tropical Coastal Floodplain Forest of the NSW North Coast bioregion*
Conservation status in NSW: Endangered Ecological Community

Description

This sub-tropical forest occurs on the coastal floodplains of the North Coast of NSW. It has a tall open tree layer of eucalypts, which may exceed 40 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality.

While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include *Eucalyptus tereticornis* (forest red gum), *E. siderophloia* (grey ironbark), *Corymbia intermedia* (pink bloodwood) and, north of the Macleay floodplain, *Lophostemon suaveolens* (swamp turpentine).

Other trees may be scattered throughout at low abundance or locally common at few sites, particularly where there is an influence from lithic substrates upslope. These include *Eucalyptus moluccana* (grey box), *E. propinqua* (grey gum), *E. seeana* (narrow-leaved red gum), *Angophora subvelutina* (broad-leaved apple), *E. robusta* (swamp mahogany), *Eucalyptus resinifera* subsp. *hemilampra* (red mahogany), *E. acmenoides* (white mahogany), *Angophora woodsiana, A. paludosa* and rainforest trees such as *Ficus* spp. (figs) and *Cupaniopsis* spp. (tuckeroos).

A layer of small trees may be present, including *Allocasuarina torulosa* (forest oak), *Alphitonia excelsa* (red ash), *Glochidion ferdinandi* (cheese tree), *Callistemon* spp., *Melaleuca* spp. and *Casuarina glauca* (swamp oak).

Scattered shrubs include *Breynia oblongifolia, Acacia concurrens, Commersonia* spp., and *Hibiscus* spp. Occasional vines include *Eustrephus latifolius, Parsonsia straminea* and *Geitonoplesium cymosum*. The groundcover is composed of abundant forbs, scramblers and grasses including *Imperata cylindrica, Themeda australis, Vernonia cinerea, Dianella caerulea, Pratia purpurascens, Cheilanthes sieberi* and *Dichondra repens*.

The composition and structure of the understorey is influenced by grazing and fire history, changes to hydrology and soil salinity and other disturbance, and may have a substantial component of exotic grasses, vines and forbs.

Location and habitat

Distribution

Subtropical Coastal Floodplain Forest is known from parts of the Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes and Port Stephens, but may occur elsewhere in this bioregion. Major examples once occurred on the floodplains of the Tweed, Richmond, Clarence, Macleay, Hastings and Manning Rivers, although smaller floodplains would have also supported considerable areas of this community.

The extent of the Subtropical Coastal Floodplain Forest prior to European settlement has not been mapped across its entire range. However, the remaining area of Subtropical Coastal Floodplain Forest is likely to be considerably smaller and is likely to represent much less than 30% of its original range. There are less than 350 ha of native floodplain vegetation on the Tweed lowlands.

Small areas of Subtropical Coastal Floodplain Forest are contained within existing conservation reserves, including Stotts Island, Ukerebagh and Limeburners Creek Nature Reserves and



Bundjalung and Myall Lakes National Parks. These are unevenly distributed throughout the range and unlikely to represent the full diversity of the community.

Habitat and ecology

- Occupies central or marginal parts of floodplains and sandy flats, including Pleistocene back-barrier flats; habitats where flooding is periodic and soils are rich in silt and sand, sometimes humic, and show little influence of saline ground water.
- Associated with clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains.
- Generally occurs below 50 m, but may occur on localised river flats up to 250 m elevation.
- The structure of the community may vary from tall open forests to woodlands, although partial clearing may have reduced the canopy to scattered trees. Typically these forests and woodlands form mosaics with other floodplain forest communities and treeless wetlands, and often they fringe treeless floodplain lagoons or wetlands with semi-permanent standing water.

Regional information

This species is found in the Hunter/Central Rivers and Northern Rivers catchment management authority regions.

Reference

"NSW Scientific Committee (2004) Subtropical coastal floodplain forest of the NSW North Coast bioregion - Endangered ecological community determination - final. DEC (NSW), Sydney."



APPENDIX C

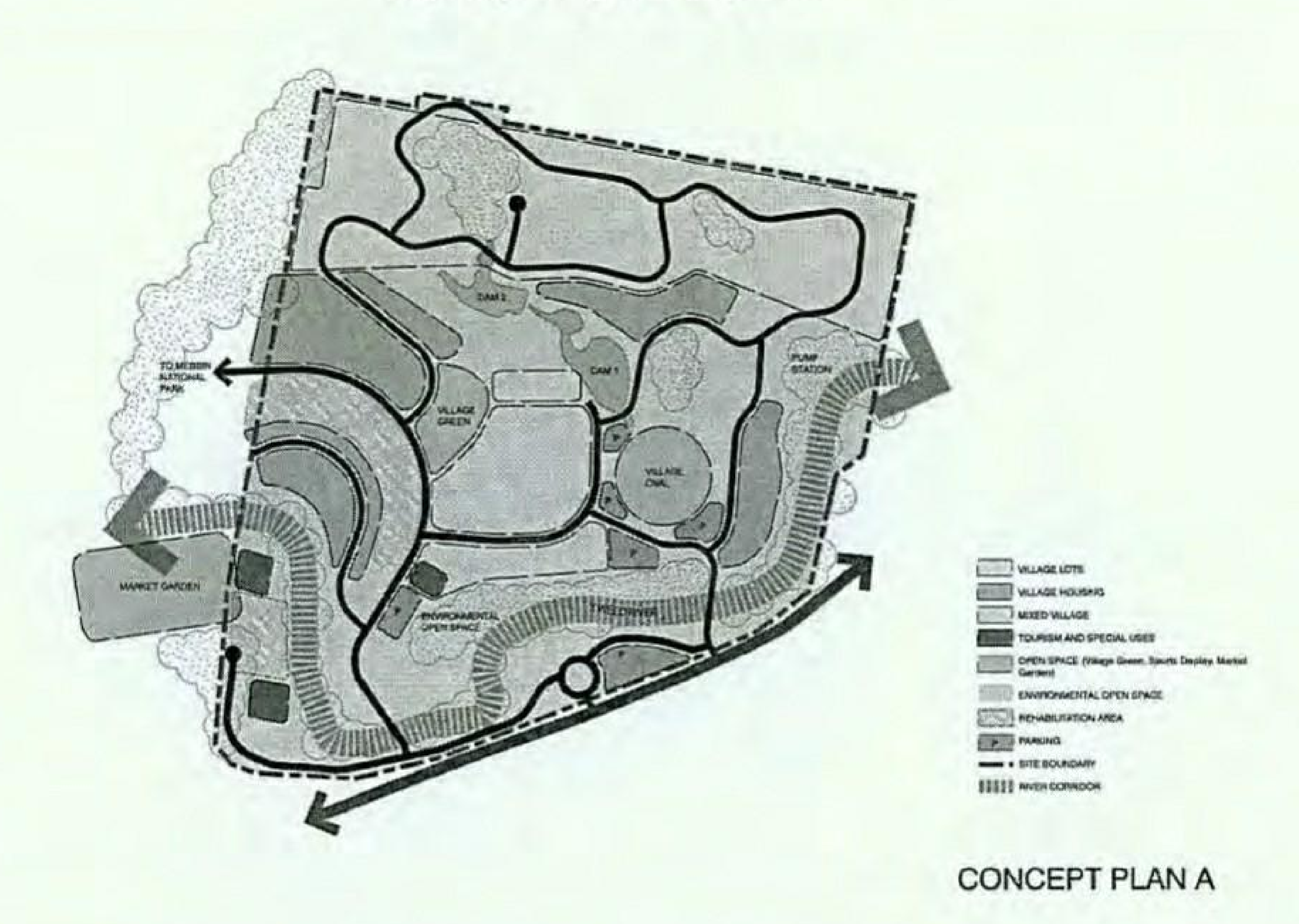
Rehabilitation Concept Plan



REHABILITATION CONCEPT PLAN

The proposed Nightcap Village plan of development makes provision for the retention and rehabilitation of native vegetation on the site for a variety of nature conservation and landscape amenity purposes. In this respect the Nightcap Village Concept Plan, presented below, identifies key areas where vegetation retention and rehabilitation strategies are to be implemented within the site boundaries.

Nightcap Village Concept Plan



CONCEPT PLAN A

Vegetation Retention and Rehabilitation Areas

As part of the Nightcap Village development substantial areas of existing native vegetation will be retained and will be incorporated into the layout of development. These areas of vegetation to be retained possess significant ecological and landscape amenity values and include:

- existing riparian vegetation lining the bed and banks of the Tweed River, which traverses the southern sector of the site, that provide habitat for a diversity of native wildlife species including significant fauna species such as the Koala; and

- several pockets of native forest vegetation that are scattered throughout the site, including areas that provide habitat for significant flora species such as the Green-leaved rose walnut.

The retention of these areas of native vegetation provides an opportunity to rehabilitate these areas through the removal of declared weed species and other significant exotic species and the planting out of appropriate endemic native plant species thereby improving and enhancing the ecological and landscape amenity values of these vegetation communities.



Re-vegetation Areas

The proposed plan of development incorporates the revegetation of Rehabilitation Areas as illustrated in the attached Concept Plan. The vegetation within these areas is currently in a highly disturbed state and is characterised by grassland with scattered trees.

Under the proposed plan of development, these areas would be rehabilitated, involving:

- the removal of declared weed species and other significant introduced plant species; and
- the planting out of suitable, locally endemic flora species to restore vegetation communities that occur naturally elsewhere within the site and those described within the Tweed Vegetation Management Strategy, 2004[15].

These rehabilitation works would improve the ecological values of degraded areas within the site and would enhance their visual and scenic amenity.

Special consideration is required for any rehabilitation within the site that is to be undertaken within the recommended bushfire setbacks as discussed in the Bushfire Management Plan prepared for the site by Cardno. In this respect, the species should be selected that are appropriate in terms of their potential fuel load capacity.

Species Selection

The rehabilitation/revegetation strategies to be followed within the Rehabilitation Areas within the buffers and landscape stands (i.e. retained clumps of native vegetation and riparian vegetation associated with the Tweed River) would involve the removal of any existing infestation of weed species, removal of deposited miscellaneous waste, and the planting out of suitable, locally endemic flora species to restore vegetation communities that would have naturally occurred in the subject areas. In this respect the rehabilitation programs would be designed to establish, via active planting and encouragement of natural regeneration, a complex of vegetation communities derived from the following vegetation types of the Tweed Vegetation Management Strategy 2004[20]:

Vegetation Type 206: Flooded Gum Open Forest which is described as follows.

> *...a tall open to open, wet sclerophyll forest on moderate to fertile soils, often in sheltered moist locations such as valley floors along watercourses. Flooded Gum* (Eucalyptus grandis) *is generally the clear dominant species but this species often occurs with one or two associates. Typically associated canopy species, which occur as co-dominants include Brush Box* (Lophostemon confertus) *and Tallowwood* (E. microcorys). *Flooded Gum open forest frequently occurs with a rainforest understorey, which may in time replace this type. This species is known to require a major disturbance event such as fire to regenerate, forming as small even-aged stands. Species that occur as locally or sub-dominant species include Sydney Blue Gum* (E. saligna), *Turpentine* (Syncarpia glomulifera), *White Mahogany* (E. acmenoides), *Pink Bloodwood* (Corymbia intermedia), *Hoop Pine* (Araucaria cunninghamii) *and Silky Oak* (Grevillea robusta).

Vegetation Type 102: Sub-tropical/Warm Temperate Rainforest which is described as follows.

[20] Kingston, M.B., Turnbull, J.W. and P.W. Hall (2004) *Tweed Vegetation Management Strategy 2004 Volume 3 of 3 – Appendices.* A report prepared for Tweed Shire Council by Ecograph: Ecological and Geographical Information Systems Consultants – Limpinwood, NSW



Sub-tropical Rainforests are the most complex sub-formations within NSW, occurring in warm sites with a high annual rainfall. Typically comprising two or three vegetation strata and forming an uneven canopy with strangling figs, palms, plank buttresses, large epiphytes and woody vines (Floyd 1990). These forests occur at low altitudes on fertile lowland krasnozem soils near sea level or on basaltic soils up to 600m.

Main canopy species of this component include White Booyong (Argyrodendron trifoliolatum), *Red Carabeen* (Geissois benthamii), *Marara* (Pseudoweinmannia lachnocarpa), *Pepperberry Ash* (Cryptocarya obovata), *Cudgerie* (Flindersia schottiana), *Yellowwood* (F. xanthoxyla), *Red Cedar* (Toona ciliata), *Tulipwood* (Harpullia pendula), *Blue Quandong* (Elaeocarpus angustifolius), *Hard Quandong* (E. obovatus), *Myrtle Ebony* (Diospyros pentamera), *Black Bean* (Castanospermum australe), *Red Bean* (Dysoxylum muelleri), *Purple Cherry* (Syzygium crebrinerve), *Bangalow Palm* (Archontophoenix cunninghamiana), *Cabbage Palm* (Livistona australis), *Black Booyong (Argyrodendron actinophyllum), Giant Stinging Tree* (Dendrocnide excelsa), *Yellow Carabeen* (Sloanea woollsii), *Rosewood* (Dysoxylum fraserianum), *Giant Water Gum* (Szygium francisii), *Soft Corkwood* (Caldcluvia paniculosa), *Pigeonberry Ash* (Cryptocarya erythroxylon), *Prickly Ash* (Orites excelsa), *Doughwood* (Melicope octandra) *and Red Apple* (Acmena ingens).

Warm Temperate Rainforests contain fewer species than sub-tropical and dry rainforests and forms a more uniform canopy with typically two vegetation strata (Floyd 1990). They occur in cool, moist areas and tend to lack epiphytes, orchids and tropical features such as stranglers, plank buttresses, woody vines and palms (Floyd 1990). The occurrences of this suballiance within Tweed Shire are among the most floristically diverse in NSW due to their geographical location and mixed nature (Floyd 1990). They occur on less fertile metasediments, basaltically enriched metasediments and on rhyolite with basaltic enrichment on alluvial flats. Specific occurrences are Hogan's Scrub Wildlife Refuge (containing a State record for different tree species present (Floyd 1990)), lower Couchy Creek and Christies Creek in Mooball State Forest.

Main canopy species of this component include Jackwood (Cryptocarya glaucescens), *Sassafras* (Doryphora sassafras), *Mango Bark* (Canarium australasicum), *Yellow Carabeen* (Sloanea woollsii), *Durobby/Coolamon* (Syzygium moorei), *Coachwood* (*Ceratopetalum apetalum*), *Callicoma* (Callicoma serratifolia), *Water Gum* (Tristaniopsis laurina), *Bennet's Ash* (Flindersia bennettiana) *and some sub-tropical species.*

In addition, the rehabilitation of vegetation communities may also include native species that have been recorded on the site during field surveys, such as:

- **Canopy species** such as Flooded gum, Brush box, Silky oak, Tallowwood, Pink Bloodwood, Grey Ironbark and Hoop Pine;
- **Midstorey species** such as Tree heath, Lightwood, Coffee bush, Poison peach, Black bean, Hard quandong, White cedar, Native tamarind, Maiden's wattle, Rice flower, Steelwood, Native guava, *Seringia arborescens*, Sweet pittosporum, Tree heath, Broad-leaf palm lily, Rose myrtle, Tuckeroo, Guioa, Pointed-leaf hovea, Sandfly zieria, Brown tuckeroo, Red ash, Cockspur thorn, Sandpaper fig, *Gossia hillii*, Macaranga, Soft corkwood, Foambark, Laceflower tree, Green wattle, Jackwood, White bottlebrush, Scrub turpentine, *Persoonia conjuncta*, Red kennedy pea, Bennett's ash, Silky myrtle, Lilly pilly, Rusty helicia, Kangaroo Vine and Red kamala.
- **Ground layer species** such as Austral sarsparilla, Snake vine, *Lomandra longifolia,* Bracken, *Lomandra hystrix,* Rough maidenhair fern, *Blechnum* sp., Barbed wire grass, *Gahnia aspera* and Soft bracken.

Species selection and plant placement will be undertaken in an appropriate manner taking into consideration the habitat requirements of the each particular plant species.



Vegetation of Conservation Significance

The Flooded gum (*Eucalyptus grandis*) open forest community on the site (refer Section 4.2.2 and Figure 3 of the Ecological Assessment prepared by Cardno), in which the *Endangered* flora species Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*) pursuant to the *Threatened Species Conservation Act 1995* was recorded, is to be retained as illustrated in the Concept Plan. The opportunity for the rehabilitation of this community via the removal of exotic weed species and planting out of endemic native species would assist in the conservation and protection of this significant flora species within the site.

The rehabilitation of degraded areas within the site would create additional habitat resources for native fauna species. The opportunity for rehabilitation of the buffer associated with the Tweed River will enhance and expand the existing riparian corridor that traverses this waterway, which would likely increase habitat utilisation by native fauna. In this respect, the inclusion of known Koala food trees within the revegetation of this riparian vegetation community would provide additional habitat resources for the Koala which is listed as *Vulnerable* pursuant to the *Threatened Species Conservation Act*.

It is also relevant to note that the rehabilitation and expansion in width of the riparian corridor associated with the Tweed River will increase the current extent of vegetation assemblages within the site which are considered to be broadly analogous to two Endangered Ecological Communities listed under the *Threatened Species Conservation Act*, namely the:

- *Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion*; and
- *Sub-tropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion*.

It is considered that any such increase would more than adequately compensate for losses to existing vegetation assemblages that are broadly analogous to these communities, which would occur as a consequence of the proposed plan of development.

Re-vegetation / Rehabilitation Strategies

The particular manner in which the revegetation works would be carried out will be detailed within a Vegetation Management Plan ("VMP") that would be prepared and submitted to Council in support of any subsequent applications for approval of the physical works associated with the proposed plan of development. The VMP would include detail in respect of the:

- the specific objectives of the revegetation works;
- details of the methods to be used in the revegetation works (i.e. weed control and removal, planting strategies, species etc.);
- monitoring responsibilities; and
- maintenance schedule and corrective actions.

The VMP would provide detail regarding the revegetation of the Rehabilitation Areas, the rehabilitation of the retained landscape stands (i.e. the retained clumps of native vegetation and riparian vegetation associated with the Tweed River) and other landscaping works within the site that would form part of the proposed plan of development. As previously discussed, it is recommended that the restoration of vegetation communities utilises native species that have been recorded on the site and those that are listed within the vegetation types as described in the Tweed Vegetation Management Strategy 2004.



Weed Control

As part of the development of the site existing weed infestations would be controlled. In this respect a Weed Management Plan ("WMP") would be prepared as a component part of any site based VMP. The WMP would detail:

1. the current extent and distribution within the site of declared plant species pursuant to the *Noxious Weeds Act 1993*;

2. suitable methods of chemically and mechanically controlling these existing infestations;

3. suitable methods of disposing of removed weed material;

4. appropriate strategies for ensuring additional declared plant species are not introduced to the site during construction activities (e.g. hosing down of construction machinery prior to entry to the site, ensuring the use of clean fill etc.);

5. an appropriate post-control monitoring program; and

6. a task schedule outlining the timing of relevant management actions and the roles and responsibilities of relevant parties.

At present, the site supports several declared weeds pursuant to the *Noxious Weeds Act*. These weeds are listed the table below.

Species Name	Common Name	Control Category *
Baccharis halimifolia	Groundsel bush	W2
Ageratina adenophora	Crofton weed	W3
Lantana camara	Lantana	W3
Ageratina riparia	Mistflower	W3
Cinnamomum camphora	Camphor laurel	W4 (d)

Within the Far North Coast Weeds district the following Control Categories apply.

W1 = The presence of these weeds on land (or on/in water) must be reported to the Local Control Authority, and the weed must be fully and continuously suppressed and destroyed

W2 = The weed must be fully and continuously suppressed and destroyed

W3 = The weed must be prevented from spreading and its numbers and distribution reduced

W4 = The action specified in the declaration must be taken in respect of these weeds

W4(b) = The weed must not be sold, propagated or knowing distributed and any existing weed must be prevented from flowering and fruiting

W4(d) = The weed must not be sold, propagated or knowingly distributed and the weed must be fully and continuously suppressed and destroyed if it is:

- *three (3) metres in height or less; or*
- *within half a kilometre of remnant urban bushland, as defined by SEPP 19, and is not deemed by a local control authority as having historical or heritage significance; or*
- *is over three metres in height and not included in a Management Plan approved by the local control authority.*
- *The W4(d) declaration applies to Copmanhurst, Kyogle, Richmond Valley and Lismore Council areas and that part of Ballina Council area south of the Bruxner Highway*



W4(f) = Shall not be sold, propagated or knowingly distributed. Occupiers must implement any biological control or other program directed by the local control authority must be implemented.

W4(g) = The weed must not be sold, propagated or knowingly distributed.

Every effort would be made to ensure that the proposed development does not result in the introduction to or further spread within the site of declared pest plants, pursuant to the *Noxious Weeds Act*.

Any declared pest plants identified as having been introduced to the site as a consequence of the proposed development would be controlled using appropriate means of chemical or mechanical weed control.